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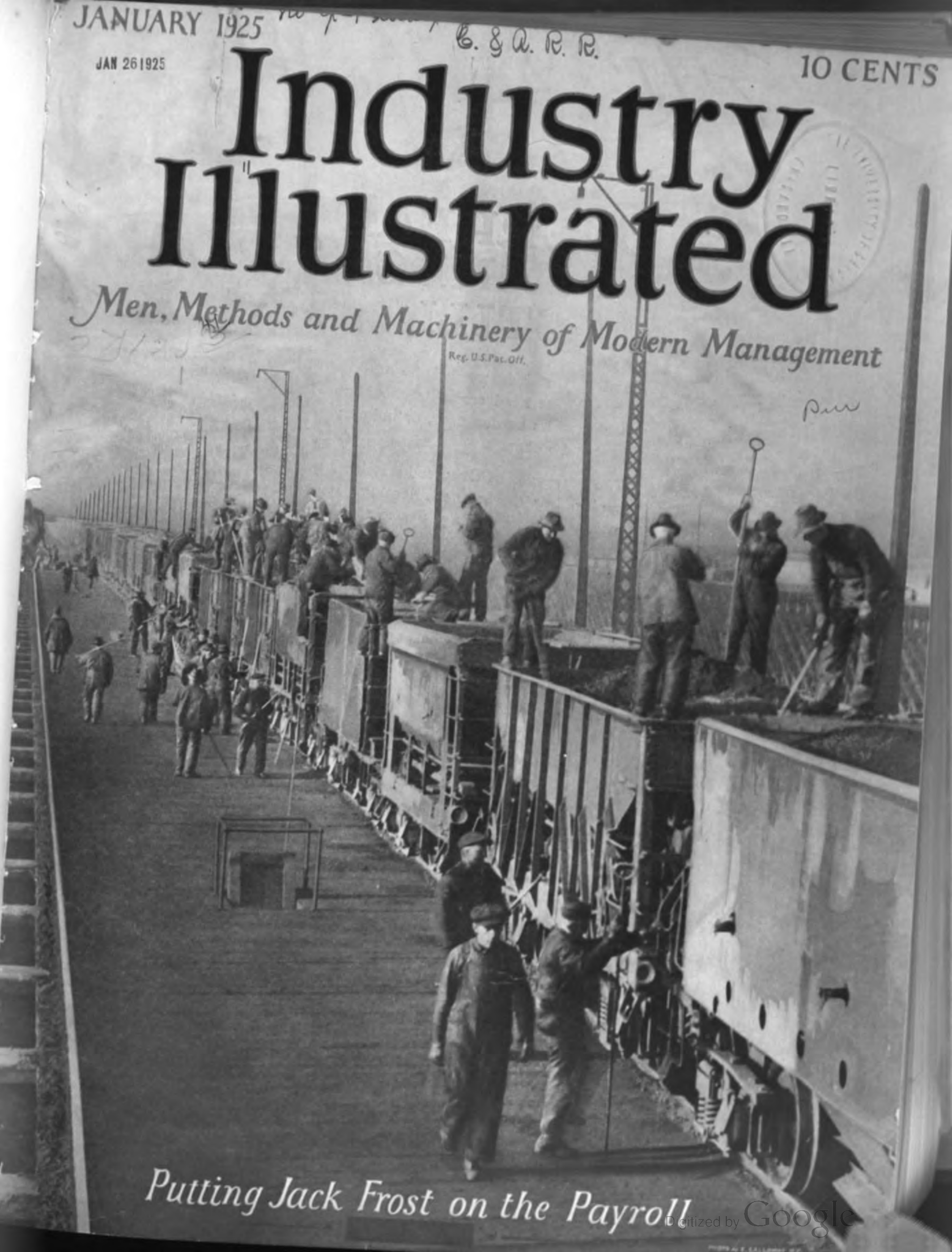
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Putting Jack Frost on the Payroll

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The expression of Overhead is neither cynical, ironic, cruel, nor relenting. It merely watches while you who represent industry struggle or toy with your load. Its expression is what you make it.

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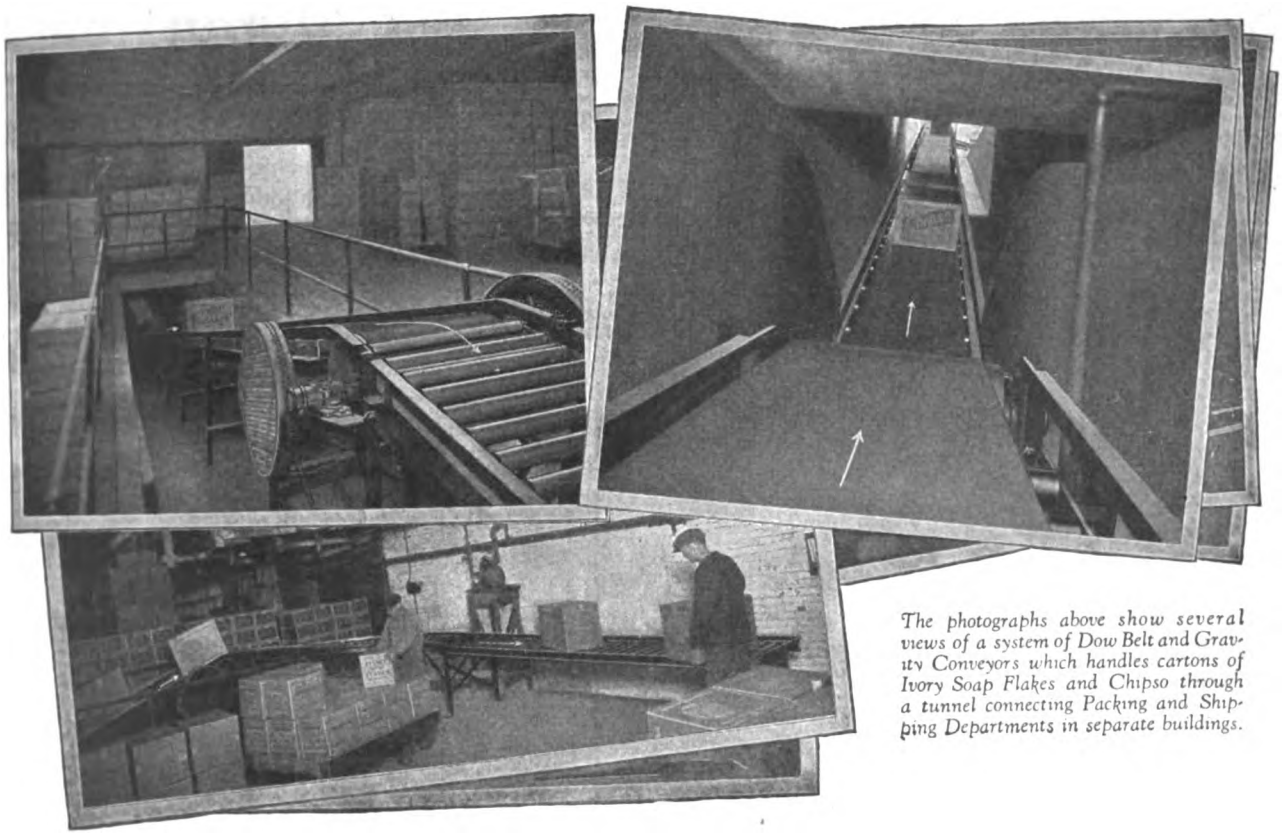
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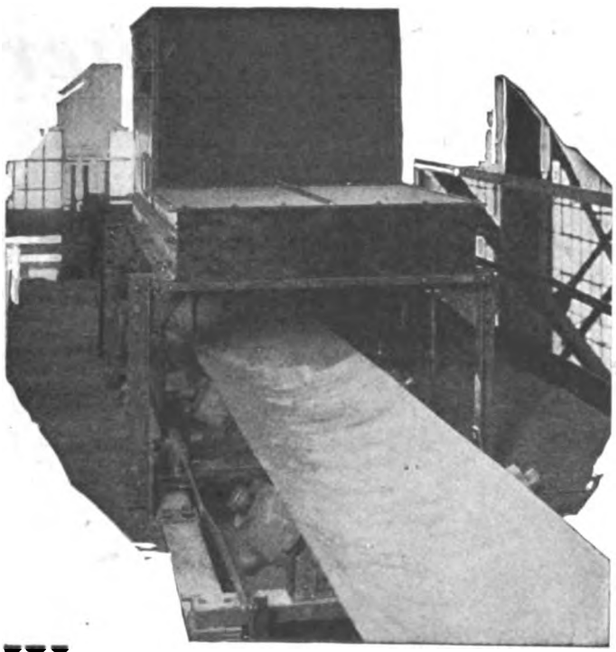
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WE believe that no publication can be a leader in its field if it is content to merely follow and reflect opinions and ideas of its readers. To be a leader, a publication must not imitate nor follow but rather *lead* the thoughts of its readers into those channels which are most profitable to them under present and coming conditions. Thus, for example, INDUSTRY ILLUSTRATED, anticipating immigration restriction and the consequent scarcity of crude labor, pioneered in leading executive thought to the subject of materials handling. As a result many millions of dollars have been saved to American industry through an executive appreciation and knowledge of the cost savings possible through materials handling equipment.

Editorial research and study have convinced us that there is an equal if not greater field of potential savings which will come through directing executive attention to the control and reduction of power costs. Any one who has read the disclosures in our December issue with regard to the amount involved in waste and neglect of power costs in the average plant, will emphatically agree with us.

Knowing these facts it becomes our duty during the coming year to undertake an equally important pioneering task in acquainting American industrial executives practically and effectively with the means of converting their power wastes into profits.

A unique editorial campaign has been worked out to effect this purpose. We can say without fear of exaggeration that this editorial presentation will be different from and more effective than anything hitherto published on this subject. It will cover power economies from all angles, including both the production and the utilization of power. Through the awakening and education of executives with respect to power control and power costs, we are confident that INDUSTRY ILLUSTRATED will be the direct means of converting many more millions of dollars from waste into profits.

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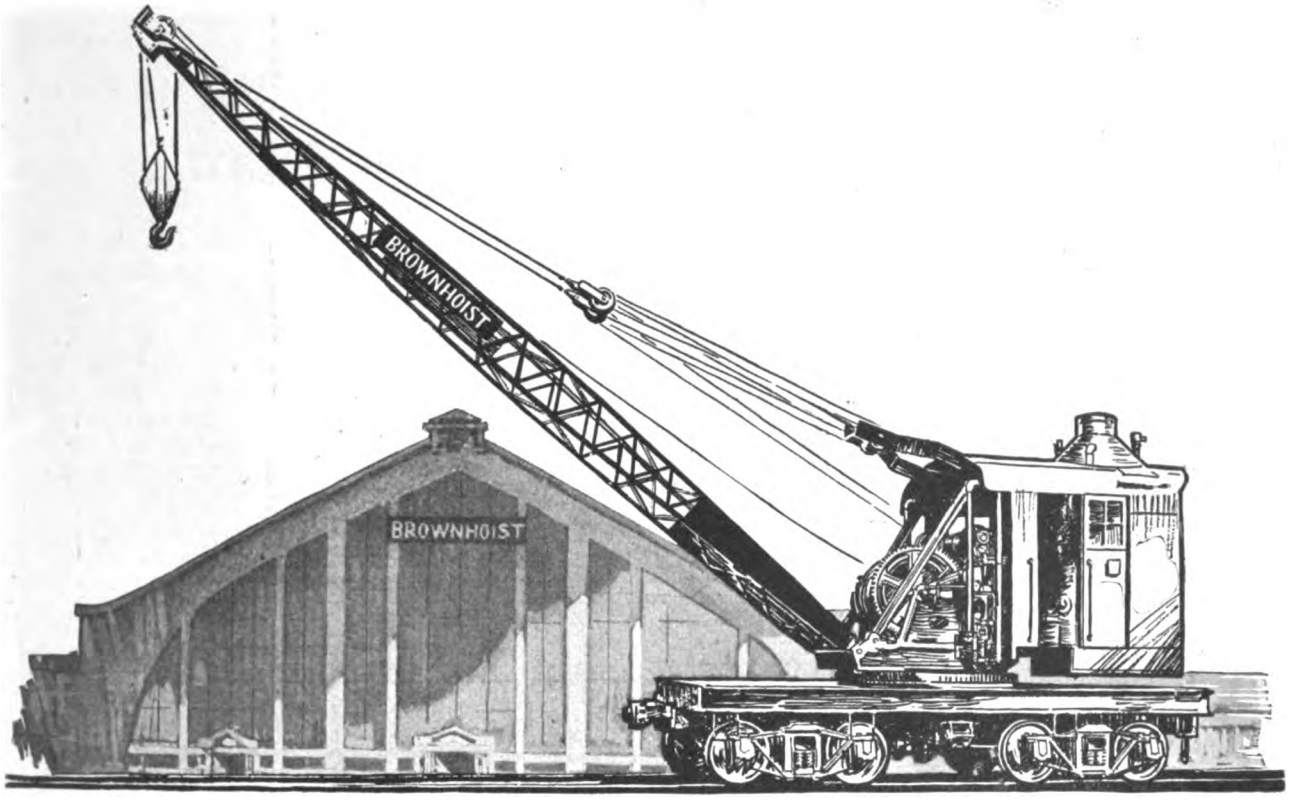
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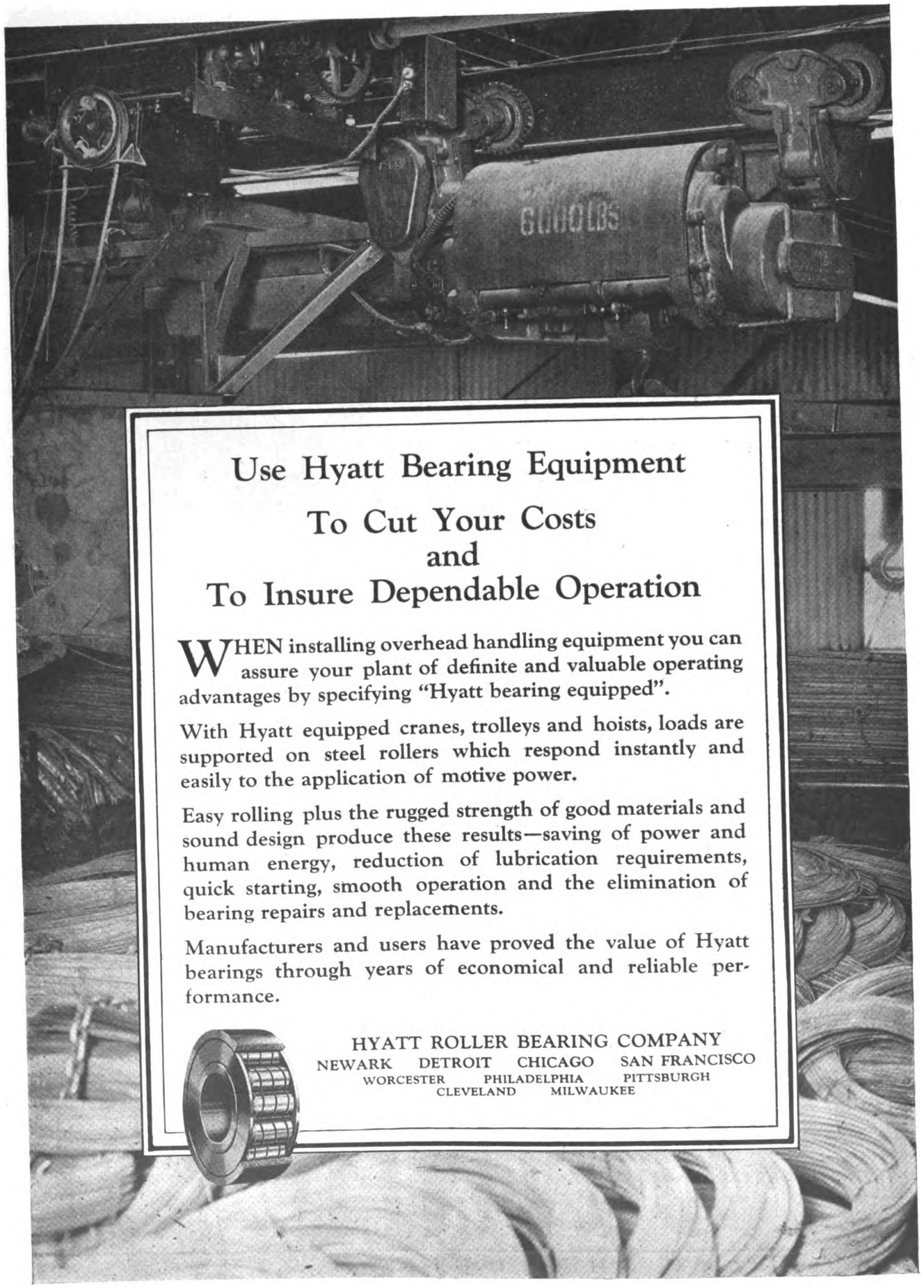
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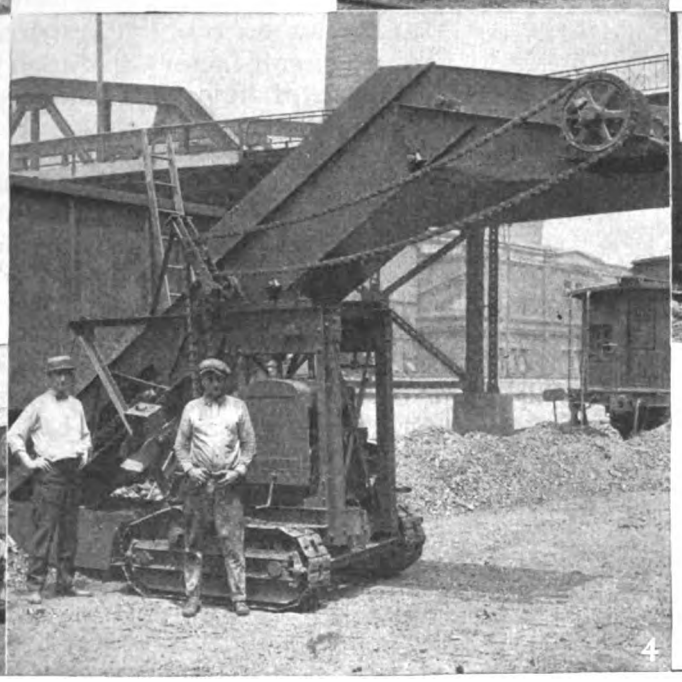
1—Barber-Greene Conveyors in action at the plant of the Reddog Products Corporation, East Liberty, Pa. Note the complete absence of shovel labor.



2—Another view of a Barber-Greene of the Reddog Products Corporation.

5—Two Barber-Greene Portable Conveyors with their jackets on. They service the Wilkinsburg Ice Company, Wilkinsburg, Pa.

3—A Barber-Greene Coal Loader loading from a small pile into a truck, for the Junction Coal and Coke Co., Pittsburgh.







4—The Junction Coal and Coke Company's coal loader loading directly from beneath a hopper-bottomed car. This method of loading has here eliminated a shovel gang, three trucks, and four wagons.

Eliminating 3 trucks, 4 wagons and a shovel gang

Loading large lump coal direct from hopper-bottom cars to trucks at the Junction Coal & Coke Co., Pittsburgh, a Barber-Greene Coal Loader has eliminated the shovel gang and the expense of operating 3 trucks and 4 wagons.

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"Mr. Barber's Scrap Book" will show you how a great many companies, working under widely varying conditions, are defeating the high costs of unskilled labor, at the same time often multiplying the speed of production. Send for a copy. It will give you much surprising and invaluable information.

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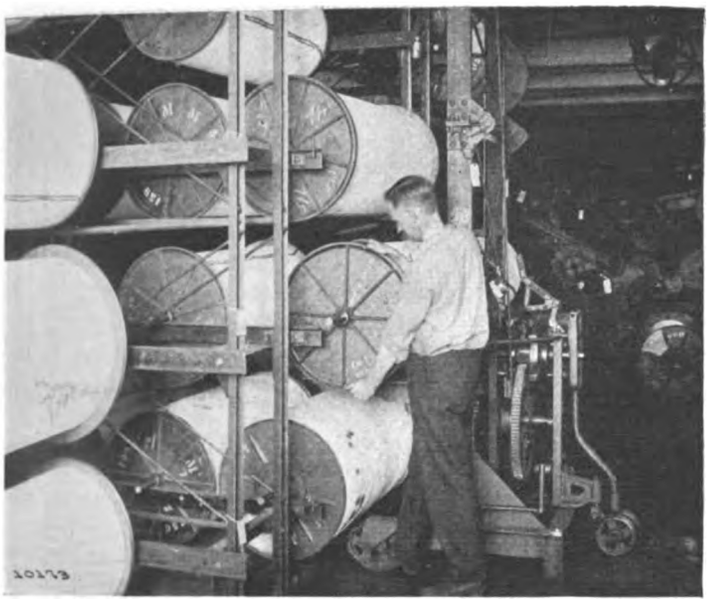
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Hyatt bearing equipped Economy Little Lifter manufactured by The Economy Engineering Co., Chicago, Ill. This photograph was taken in the Monument Mills, Housatonic, Mass.



Another model of Hyatt equipped Economy portable elevator, being used for loading and unloading freight cars.

Easy Lifting Of Heavy Loads

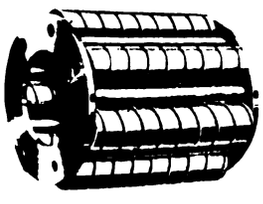
EFFECTIVE performance of heavy duty elevating and stacking trucks is dependent largely upon bearings that eliminate friction, stand the shocks of abuse and overloading and that require little attention.

Such bearings keep the trucks in uninterrupted operation, speed up work and save power and labor.

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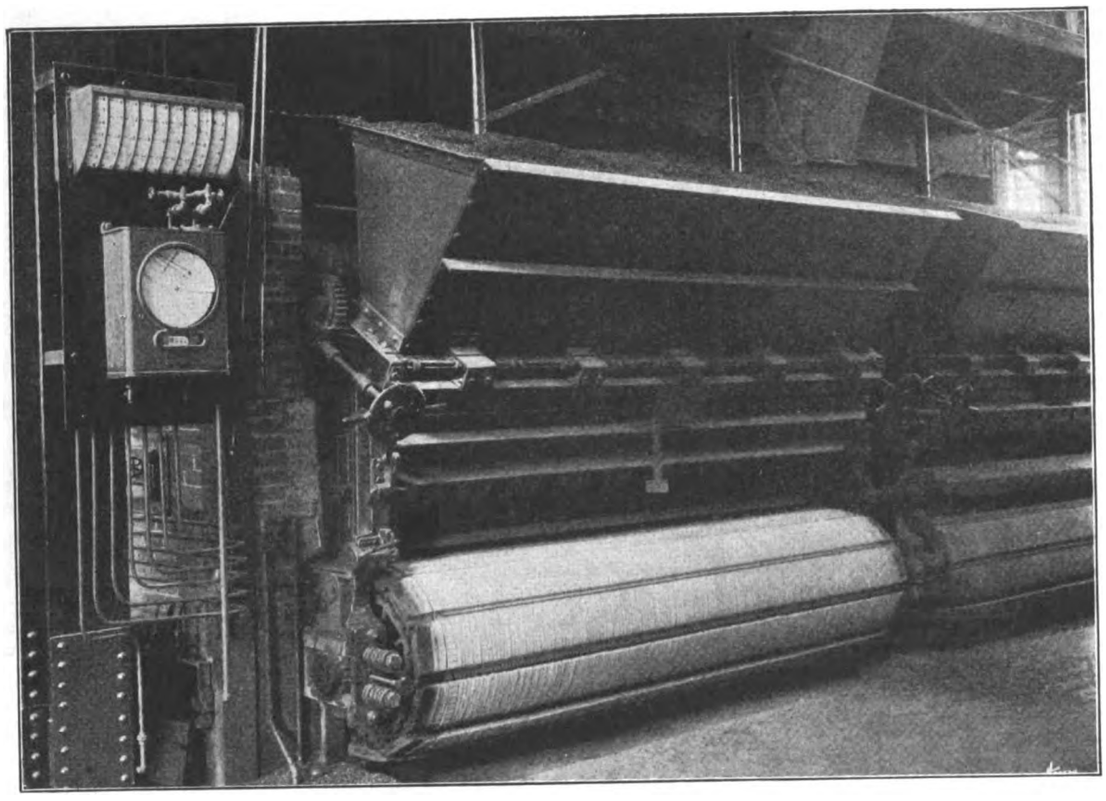
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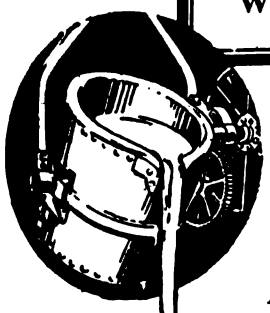
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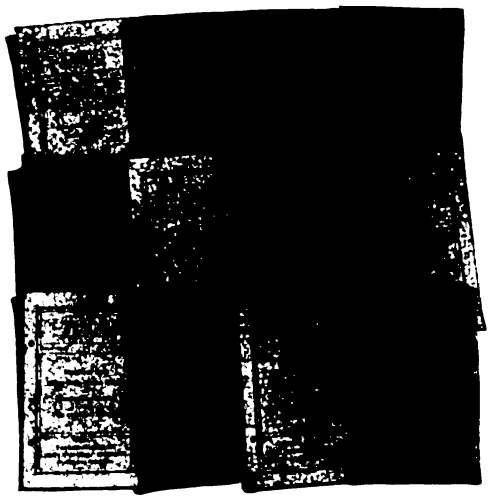
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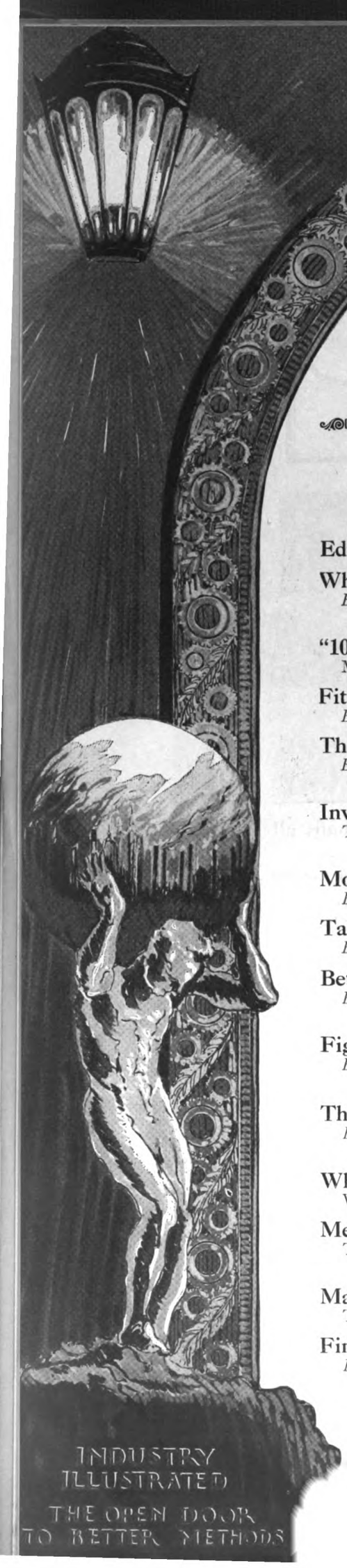
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JANUARY, 1925

Industry Illustrated

The Pictorial Presentation of Practical Management

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Not Self-Aligning

SKAYEF HANGERS

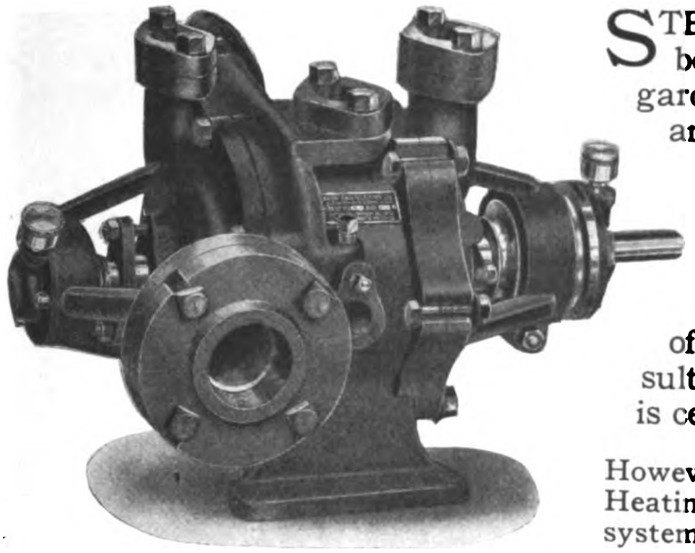
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Industry Illustrated

The Pictorial Presentation of Practical Management

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES, MATTHEW W. POTTS } *Associate Editors*

ADOLF SCHILDKRAUT, *Art Director*

Editorial

Keeping Ahead of the Times

ELSEWHERE in these pages appears the translation of an ancient Chinese proverb: "A Picture is Worth Ten Thousand Words." If that were literally true the average issue of INDUSTRY ILLUSTRATED would be equivalent to more than a million words of text! The principle, however, is true. We know, in our daily work, that while the man who can *tell* us about things is valuable, the man who can *show* us is the one who makes the greater impression and wastes a minimum of time in the process.

This same principle of showing, rather than telling, was the inception of our idea in bringing a new magazine into the field of technical journalism. The practical, successful man in modern industry is busy; he has large demands upon his time. Yet, busy as he is, to keep on being successful, he needs to be kept informed of important developments in not only his own but in allied fields. He needs to know of up-to-the-minute methods and equipment which may be adaptable to his own particular problems. This is the idea that has continued to guide our editorial policy during the past three years.

That these ideas were right—that there was a distinct place for such a method of presentation of practical information on industrial problems—has been evidenced to a gratifying degree by the remarkable growth of INDUSTRY ILLUSTRATED in the thirty-eight months of its existence.

This growth has taken place both in circulation and in advertising volume—a two-fold tribute to the soundness of our basic conception. The issue of December, 1924, for example had a net paid circulation five times that of the issue of December, 1921; carrying, at the same time, four and one-half times the volume of advertising carried three years ago.

While this growth is a source of gratification, it is more- it is an inspiration to even greater effort on our part to serve the interests of our constantly growing circle of readers.

In pioneering, there are always difficulties to overcome--difficulties for whose solution there is no precedent to act as guide. One of the difficulties we have had to face lay in the restriction of space. The subject of practical management is a broad one, with many ramifications. To give adequate presentation to its major developments each month, *pictorially*, and to do justice to each, is not a simple matter within the space at our disposal.

However, instead of *telling* you what steps we have taken to overcome these difficulties instead of *telling* you how we have increased the scope of editorial material and the effectiveness of its presentation we are *showing* you, in this, the first issue of the new year, how INDUSTRY ILLUSTRATED has been broadened and bettered to keep pace with its growth.

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Why Industry Moves

Industrial Expansion That is

By John

WINSTON CHURCHILL wrote "The Crisis," which is partly about the Civil War and chiefly about a delectable young lady named Virginia; David W. Griffith produced the "Birth of a Nation," a stupendous drama; sacrificing women bespoke funds in the churches for Southern mountain whites; and we of the North wept over all three, yearned for the days of Jackson and Robert E. Lee, and maintained our illusions of the South as the home of great estates, punctilious balls, and a bursting thermometer.

Then the world war shot a red flame through all the aristocracies of the earth, tore from a noble land the dying hand of a proud tradition, and set in full motion the slowly pressing movement of fifty years of industrial progress on the vast natural resources and unadulterated American manhood of the South.

Yet the old South that you and I loved is not dead. The glamour of that landscape is still there. The courtesy of the descendants of Britain's cavaliers is undiminished. For romance, there is no death. Only this, that in the building of the nation, the Westward march of restless individual energy, past a land of cotton and hand-labor, reached Pacific waters, paused, and, aided by the war's call for more production, swept



Fig. 1. Furniture and wooden products of all kinds belong in the South. The plant of the Carolina Wood Products Co. near Asheville, N. C., whose renowned mountain climate is good not only for tourists, but also for industry and labor.

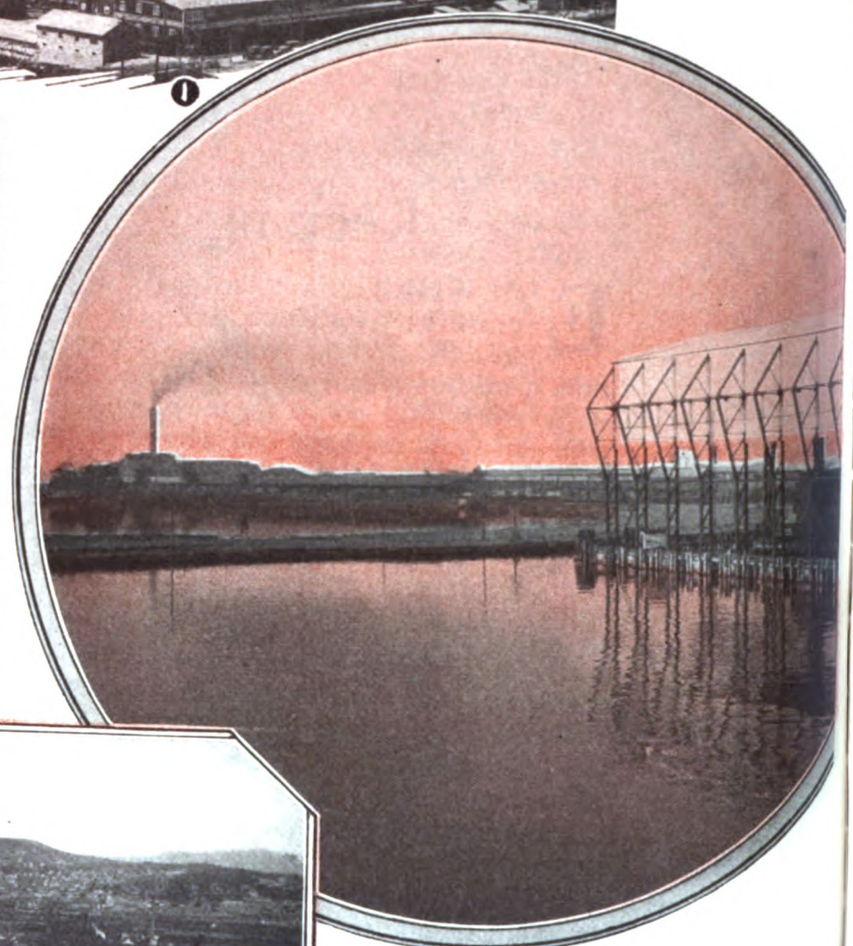
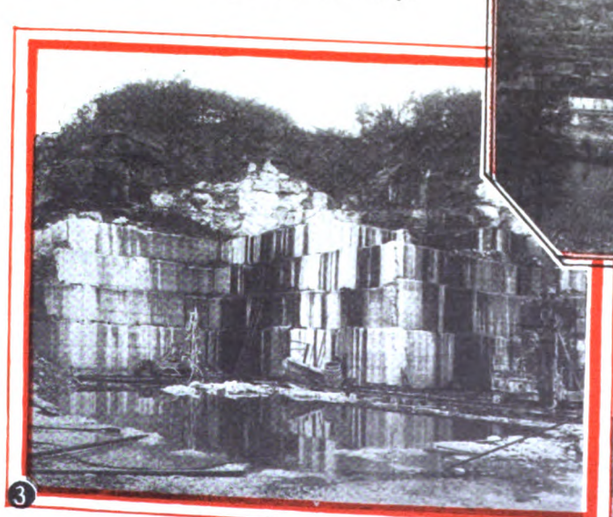


Fig. 2. Many tanneries and growing shoe and leather goods industries spring from the South's hides, tanning bark, and abundant labor.





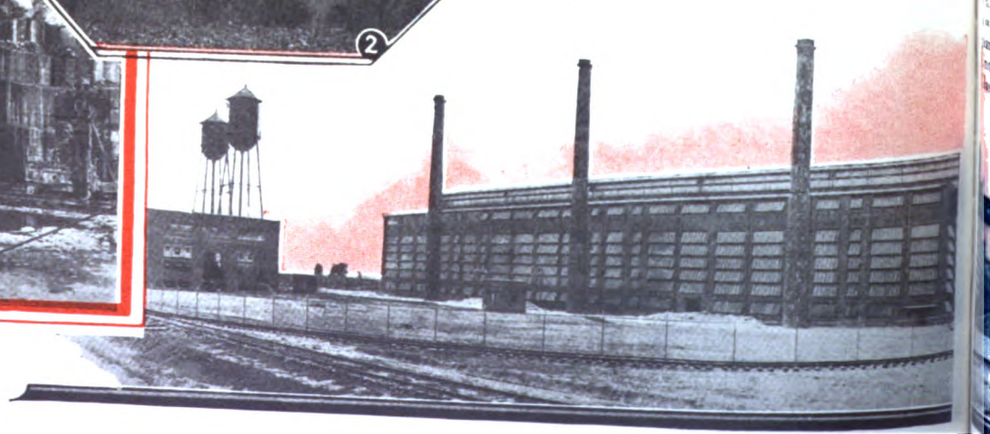


Fig. 3. Building costs are lower near the South's widespread clay, cement, and stone resources. This is a large stone quarry at Carthage, Mo.

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to the New South

Revolutionizing the Southern States

A. Piquet

Fig. 4. A vast commerce and growing industry clears through Jacksonville, Fla., the seaport hub of the Southeast. This is part of the excellent port facilities.



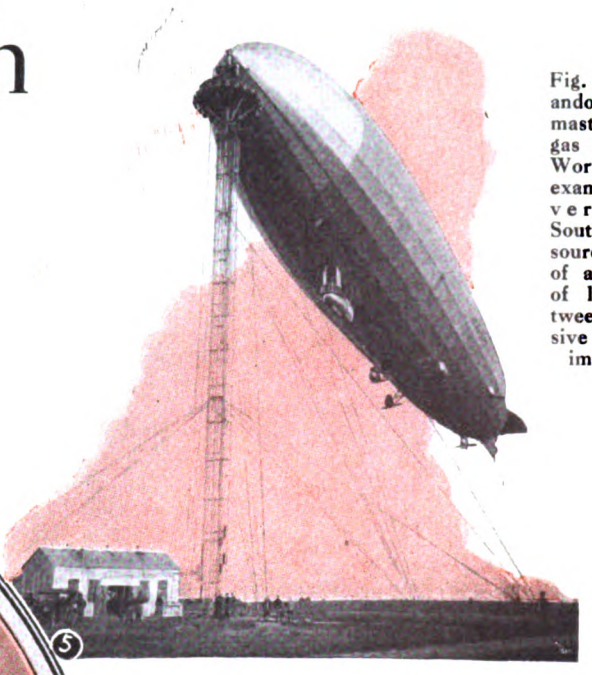


Fig. 5. The "Shenandoah" at the airmast of the helium gas plant at Fort Worth, Texas. An example of the diversity of the South's natural resources, and also of a future means of locomotion between the progressive cities of this immense state.

Fig. 6. The knitting industry is a boom one in the South, whose cheap labor and electric power help it thrive. The United Hosiery Mills Corporation at Chattanooga, Tenn., a knitting center. Note the employees' bungalows in the view, below.



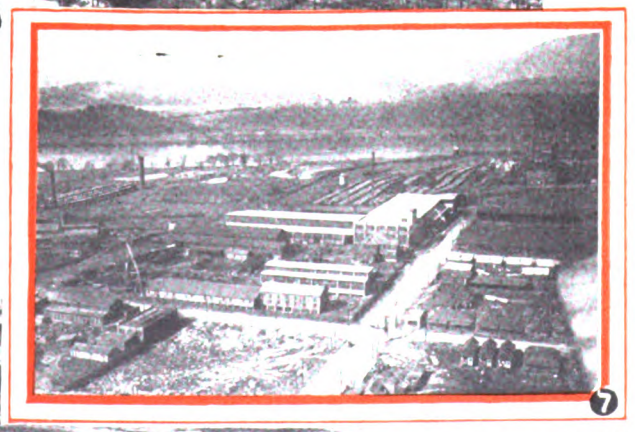


Fig. 8. The Southern glass industry grows with the increase in Southern building, plenty of glass, sand, and low living cost for labor. This is the plant, at Shreveport, La., of the United States Sheet and Window Glass Co., largest of its kind in the world.



Fig. 7. The South has a brilliant iron and steel future. This is the plant of the Walsh and Weidner Boiler Co., at Chattanooga, Tenn.

back through the whole grand tier of Southern states from Texas to Maryland, as yet untapped by three hundred years of national development.

The spirit of the illustrious gray-clad host moves on in the works of peace of its sons and daughters. The South develops itself, and gives more to the incoming entrepreneur than he pays for. It owes nothing to the outsider. The cotton industry never moved down from the North. At a multitude of water-powers and forest fuel the Southern textile mills grew strong, before Boston and Providence magnates sent their scouts to view a scene of cotton fields, cheap power, rural labor, and local capital. The smoke of furniture factories rose above the almost unbroken forest from High Point to Memphis before Grand Rapids and New York took serious notice; while from the pick of the startled prospector in the Alabama valley of coal and iron and limestone sprang a great steel industry much in advance of the Southern activities of United States Steel.

What magic strides the last few years have seen! The Kelly-Springfield Tire and Rubber Company builds its new $15,000,000 plant at the

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Fig. 9. A mill village, at Spindale, N. C., showing the general bungalow type of construction in the South, which means low living costs.

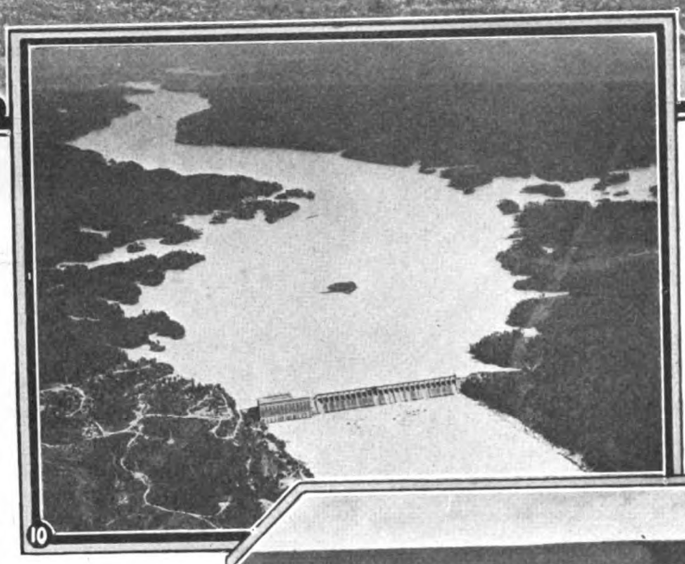
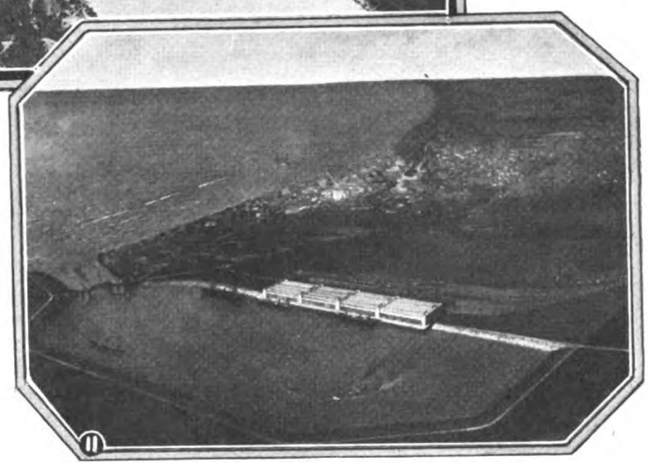


Fig. 10. A beautiful link in the South's superpower system. Lock No. 12 of the Coosa River development, Alabama Power Co.

Fig. 11. A sweeping view of Corpus Christi, Texas, and its magnificent port. East of the Rockies, all commerce ships cheaply through the South's fine ports to the Far-East, South America, Africa, and the Eastern Seaboard.



little city of Cumberland, Md., where coal, rail, water, and native American labor coincide; Ford established a half-dozen of great plants from Carolina to Texas, and buys 165,000 acres of Kentucky coal lands; the Borden Mills of New England build a great two million dollar plant at Kingsport, Tenn., which possesses the South's twin giants of power and native labor, to the accompaniment of a parade in which the whole town participates; the largest automobile body plant in the world, with a capacity of 2,000 bodies a day, is established at Memphis; the knitting industry finds the South a perfect home, and Chattanooga becomes the second largest hosiery center in the United States; New York no longer refines the South's sugar, and a $5,000,000 refinery is established in Texas.

Why is industry locating and establishing in the South? Because, in an age of markets, the South is near the great North and Middle West

(*Continued on page* 68)

Fig. 12. Industry in the country. The Anderson Mills at Lincolnton, N. C., on the Seaboard Air Line Railway, like most Southern textile mills, have plenty of room and air. The mill village is in the right background.

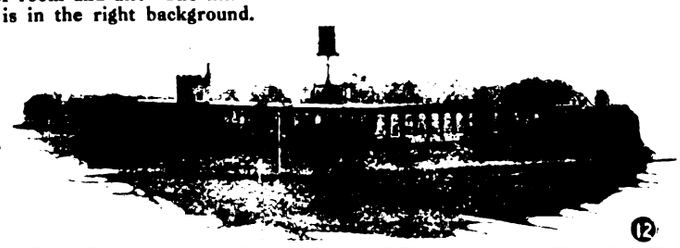
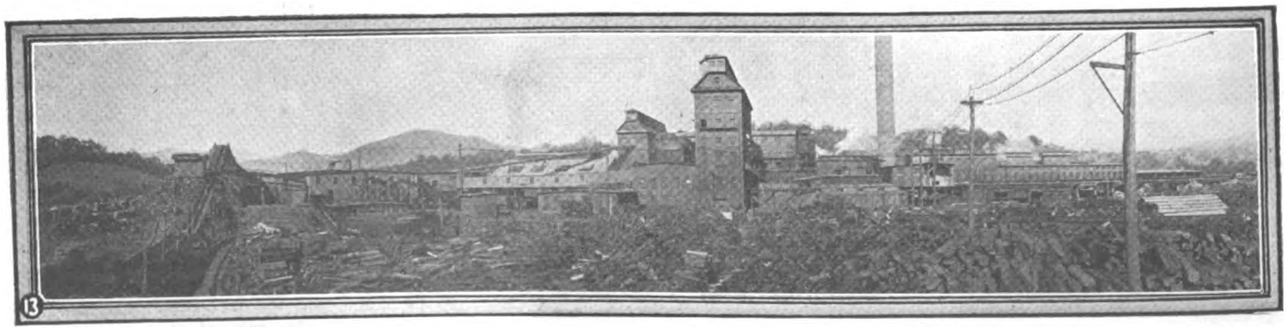


Fig. 13. The paper industry grows fast in the South. The Champion Fibre Co. at Canton, N. C., makes kraft paper and other products from mountain pines with the aid of American-born labor.



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"10,000 Words at a Glance"

An Ancient Proverb and Its Modern Application

ON the morning of December 1, 1924, newspaper readers were faced by a new and radical marvel even in this age when marvels are commonplace—the transmission of pictures by radio. Not only was the announcement made, but actual pictures were reproduced—pictures which had been transmitted by radio from London during the night.

According to General Harbord, president of the Radio Corporation of America, it was a remark made by Owen D. Young at a public dinner in February of the preceding year, which led to experiments in the transmission of pictures by radio. Mr. Young, on that occasion, remarked that radio would some day make possible the transmission to New York of the entire front page of a London newspaper, without having to send it word by word. The suggestion awakened by Mr. Young's remark was exactly of a type to appeal to the head of the Radio Corporation, not as a fantastic dream, but as a challenge.

Appropriately enough, one of the first transmissions by the new method was a picturegram of an old Chinese proverb, reproduced here. Commenting upon the achievement, Gen. Harbord said:

"There is an old Chinese proverb that 'One picture is worth 10,000 words.' This is as true today as the day it fell from the lips of the Chinese sage, for, since primitive man made his first crude drawings, pictures have been in constant use. So innate is our 'picture sense,' through centuries of cultivation, that one good picture may truly convey to us at a glance an idea or story that would require many words in the telling."

This principle, which has been the guiding star of INDUSTRY ILLUSTRATED from the beginning, is applicable not only to the presentation of technical articles; it is a principle which all of us should remember in connection with our daily work. Words require the eye to read, the brain to translate their meaning and to interpret it, and an added brain-effort in assembling these interpretations; pictures, charts, diagrams—these are direct and almost instantaneous, the eye carrying the complete message to the brain.



Major General James G. Harbord, whose broad vision and purposeful activity had much to do with the formation of the Radio Corporation of America. Through this corporation, of which Gen. Harbord is now president, was made possible a pooling of patents held by various large electrical companies; to the end that radio communication might develop to its utmost, unhampered by conflicting interests.

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Fitting the Cost Depart

Making Sure of Cost

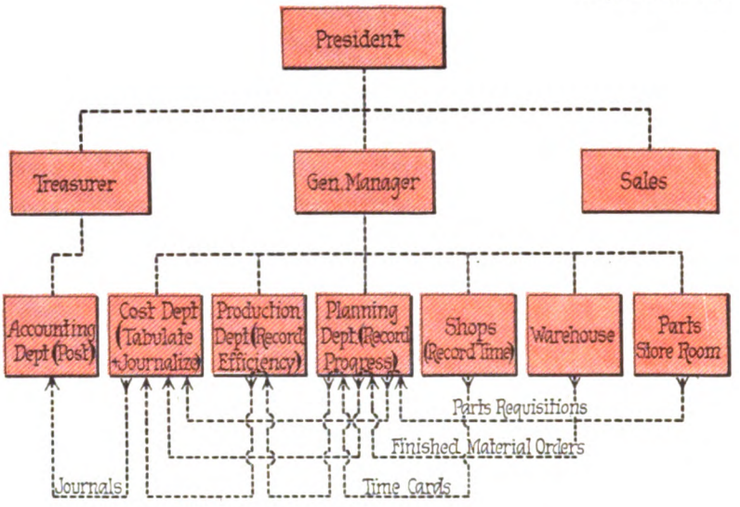
By John H.

NO business, or factory, is most effectively organized for cost reduction until its executives have done one important thing.

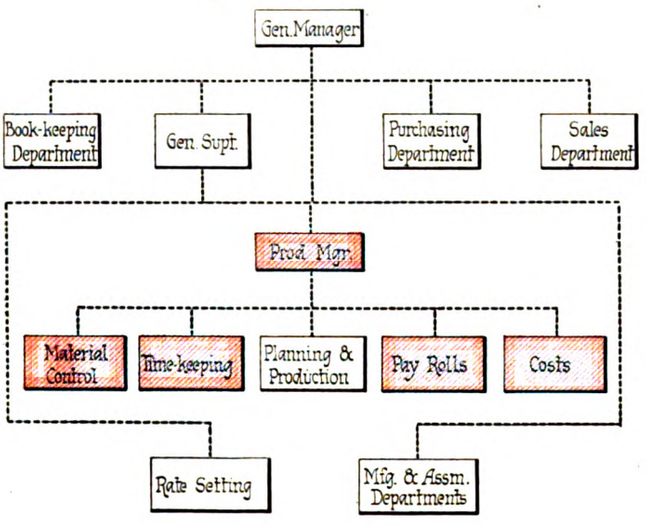
This big, important thing is to find out, or determine, and then agree upon, *what the Cost Department is for.* What part it shall play in the general program of company progress.

Cost departments fall into three classes—those that are *neglected*—those that are *endured* and those that are *utilized.*

The cost department is the statistical center of the plant or business.



The relationship of cost keeping, planning and production functions in a plant employing 700 men making valves and fittings, is shown above. The general manager is the coördinating head.



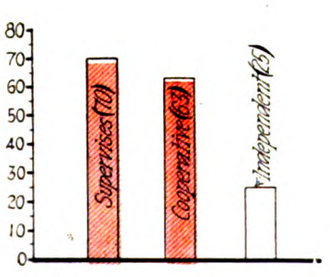
A manufacturer of engines, boilers, etc., employing 500 men, organizes his cost work directly under the production manager, paralleling the functions of planning and production.

It has the direct means of obtaining knowledge of every phase of operation, and the knowledge is power! But knowledge is power only when properly selected and properly used.

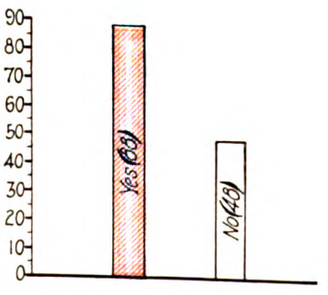
Having this source of power the Cost Department should play a prominent part in any organization for Cost Reduction.

What is the best way to fit the cost department into the organization? It is a fact that the exact hook-up of the cost department is not as important as it may be thought to be. For example, the accompanying pages show four entirely different organization plans.

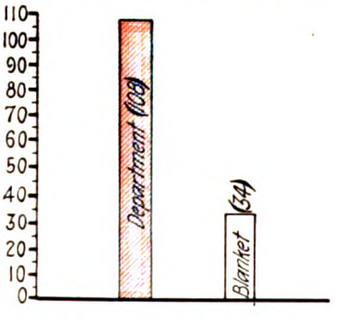
The big thing is to get in the minds of everybody a picture of what the



A survey of 158 plants shows a slight majority in which timekeeping is supervised by the cost department.



This chart based on a survey of 136 plants show a big majority using time studies.



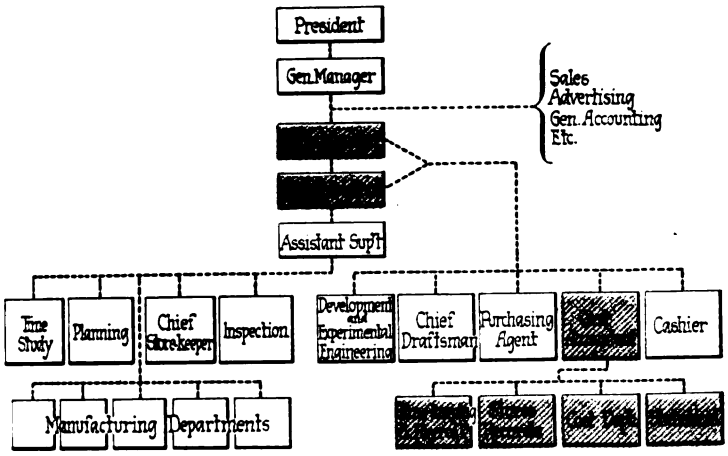
108 concerns apply overhead expense on a departmental basis. 34 stick to the blanket plan.

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ment into the Organization

Data to Insure Cost Control

Van Deventer



Here the cost work is under direct factory supervision as represented by the works manager and superintendent. This plant employs 1,100 men and manufactures cream separators.

cost department is actually for.

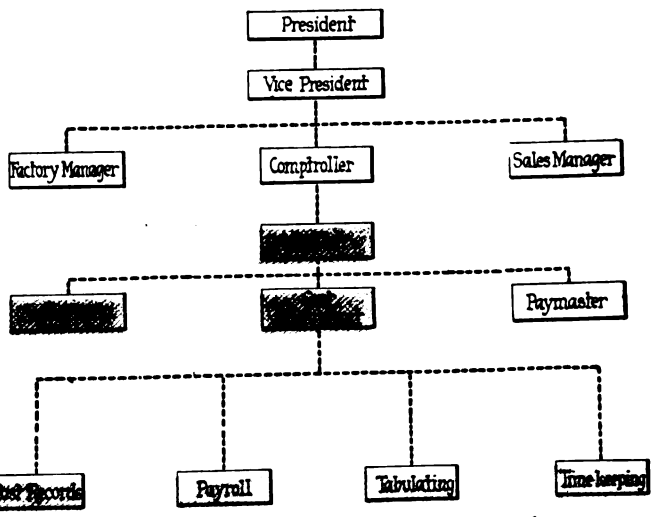
Perhaps this picture can best be conveyed by expressing it as one might if the speaker were an industrial executive who had a due appreciation of cost accounting possibilities and who was setting up objectives which he expected his cost accounting to accomplish. He might say to his cost department:

I look to Cost Accounting to be a vital aid in the executive control of this business. Yours is not a "history" department. It is not merely a cost recording department. It must be the keystone and coördinator of Cost Reduction. To this end, you must look backward only because it helps us all to look forward.

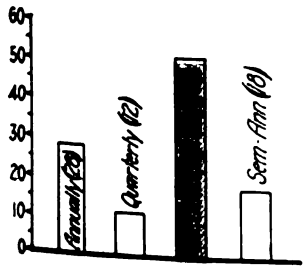
You must be both a check rein and spur for the organization. Through your well ordered routine we must prevent costs from increasing. But above and beyond your routine must come the creative cost research through which we will establish new and better standards of performance.

You are the informational center of our business. A knowledge of costs is but the beginning of your work. You must transform this knowledge into power through use. You must mix your statistics with brains and resolve them into the beacon lights of better practice.

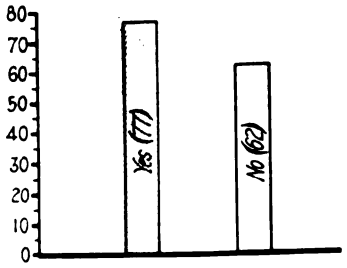
Thus, through the spur and guidance of your creative and constructive cost accounting, we shall all be kept inspired with that divine discontent which is the master force of human progress.



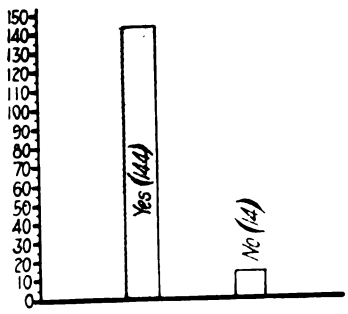
Financial administration of the cost work is quite common. It is represented here and applies to a plant of 1,600 employees manufacturing automobile radiators.



A big majority of plants revise their overhead expense figures monthly.



Out of 139 concerns 77 use cost figures to check high costs in completion of work.



Are cost departments being used to initiate economy programs? The chart above answers emphatically yes.

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Fig. 1. A general view of the B. O. T. Mfg. Company's Pottery at Trenton, N. J. This would be classed as a small plant.

The Potter Adopts Modern Methods

Mechanical Handling Transforms an Ancient Art

By Matthew W. Potts

WE often hear executives say that modern methods are possible in large plants but small plants cannot afford to make such large investments. As a plant, the plant of the B. O. T. Manufacturing Company, Trenton, New Jersey, would be classed as a small one, yet Mr. B. O. Tilden has found it to his advantage to expend over $25,000 for modern materials handling methods.

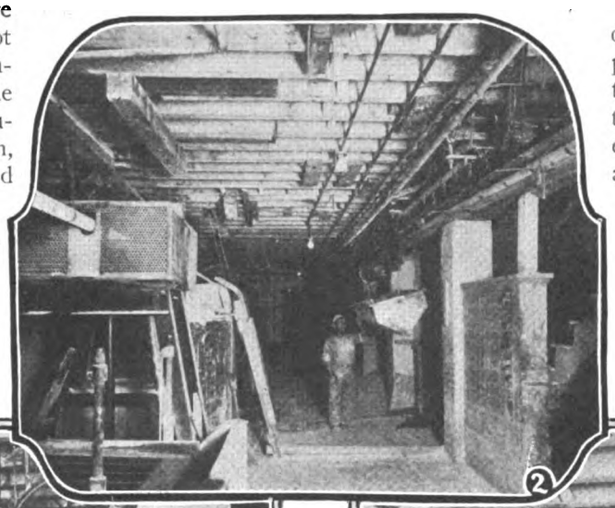


Fig. 2. The raw materials are discharged from cars direct to bins in the basement. The hoist raises the bucket for transportation. In the foreground will be seen enclosed scales for secret weighing of the various materials used.

While a few of the handling operations are shown in the photographs, this does not pretend to be a complete story on the manufacture of sanitary earthenware products; for we are only trying to show how materials handling equipment has affected this age-old industry and its methods.

To change pottery methods has required years, and very little was done until

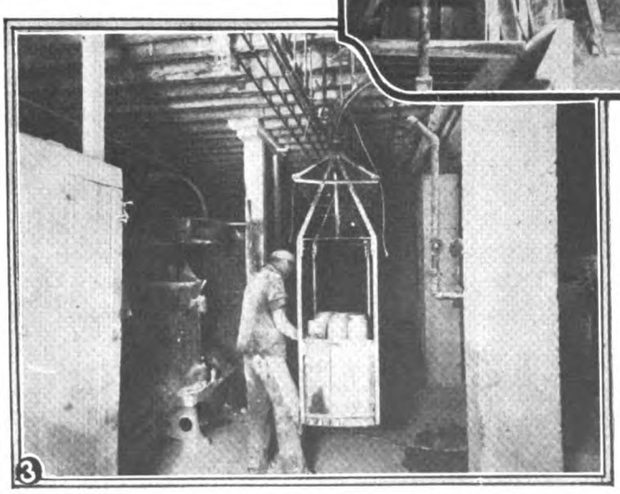


Fig. 3. Plastic clay is still used in the making of sanitary earthenware products. This shows the plastic clay being rolled out in the proper length and placed on a carrier where it is held in storage until required.

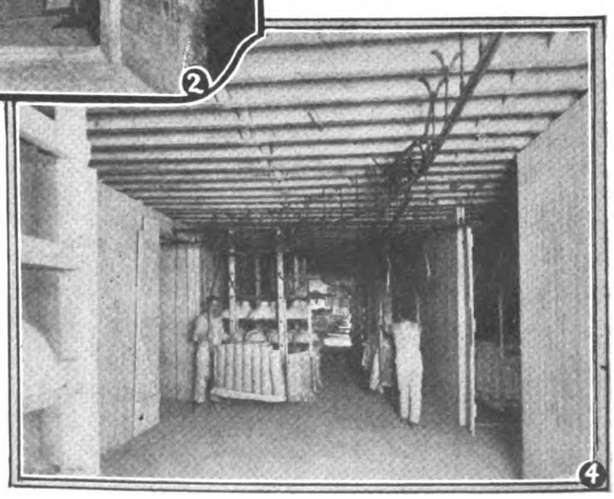


Fig. 4. This view shows how the overhead track is fastened to the ceiling and also the method of switching the plastic clay to the various departments from the storeroom. 1,500 lbs. can easily be transported by one man.

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labor conditions and keen competition forced the owners and executives to consider the use of more modern and better mechanical production methods. Fig. 11 shows how the various pieces were transported between steps in process via the "head route," one piece at a time.

The B. O. T. Manufacturing Company was one of the first potteries to consider installing modern handling methods. During their investigation they found they could not reduce the price paid to the men per piece handled because of union rates, which were more or less fixed. It was, therefore, necessary for them to consider the installation from a different angle than the cutting of labor costs, and their decision was reached on the one advantage of being able to handle from fifteen to twenty pieces in the time formerly required by one man to handle one piece. In addition, after the equipment was installed, they found that the amount of breakage was greatly reduced and there was a general speeding up in all production departments.

In making the installation, this company also anticipated future labor conditions, and when the pottery

(*Continued on page* 52)

Fig. 5. Potteries now use molds for casting their products similar to those used in foundries. In the foreground can be seen a number of molds while on the benches and shelves can be seen some of the products which have just been taken from the molds. In cast molding, clay in the form of slip is used.



Fig. 6. This shows the method of drying in wooden racks as well as the method of transporting the pieces to and from the racks.



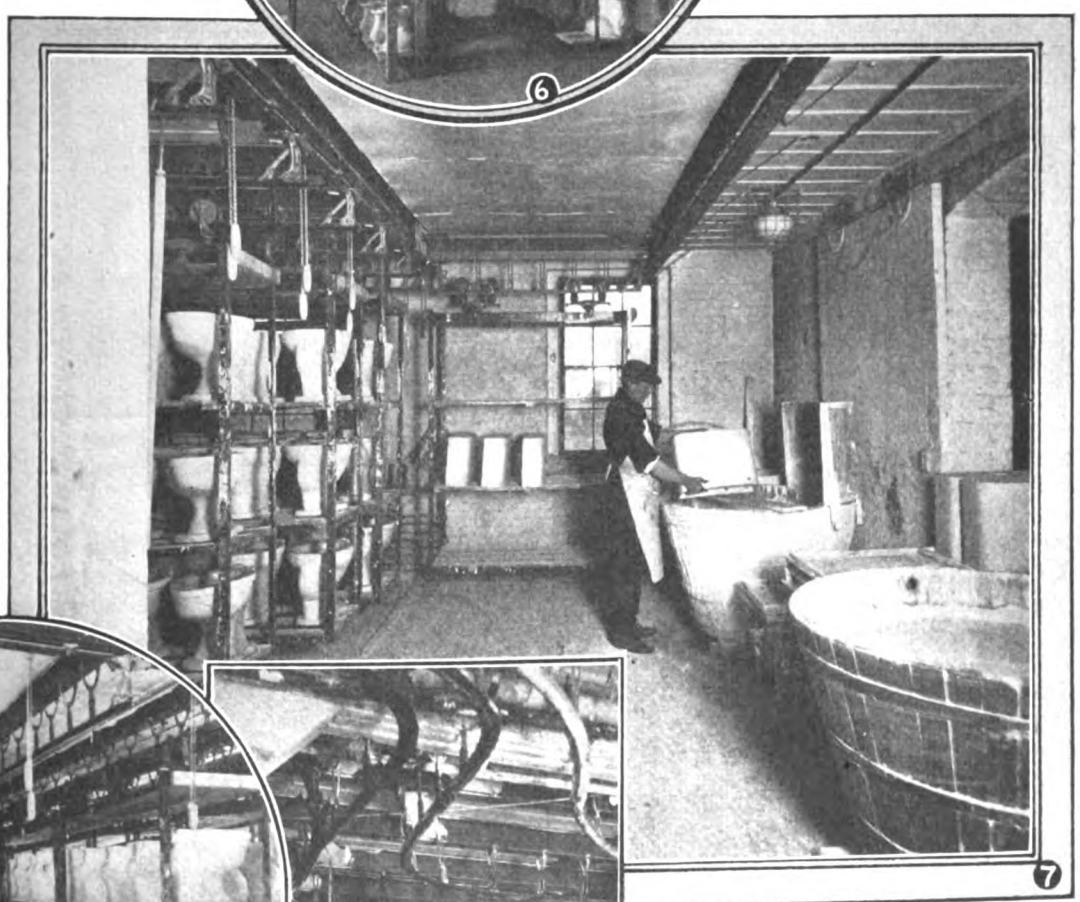




Fig. 8. On these storage tracks the glaze finish is allowed to dry before going to the kilns for final firing.

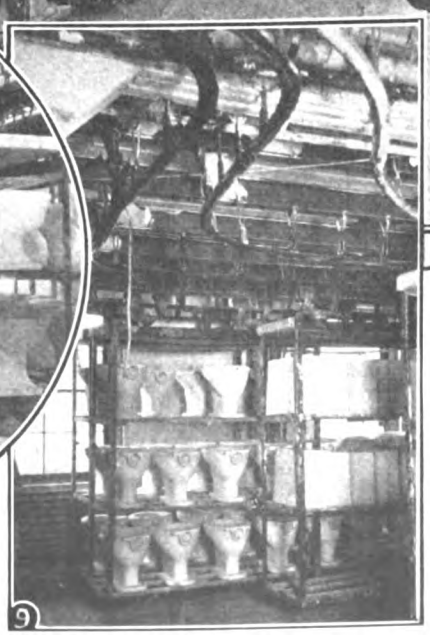


Fig. 7. After certain steps in process, the goods are dipped into a solution which puts on the glaze finish. This shows the method of dipping and the gravity conveyors which bring the pieces from the sanders to the dippers, as well as the racks upon which the dipper places the piece after completing his operation.

Fig. 9. In coming from the drying room, shown in Fig. 8, a series of switches are used in place of a transfer crane track. These are all clearly shown in this illustration.

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Invisible Profit Eaters That Boost Power Costs

The Insidious Leaks That Pass Unnoticed

"BEWARE of the invisible leaks!" This is a useful motto for any industrial executive and a particularly good one for the man who is responsible for the generation and the use of power.

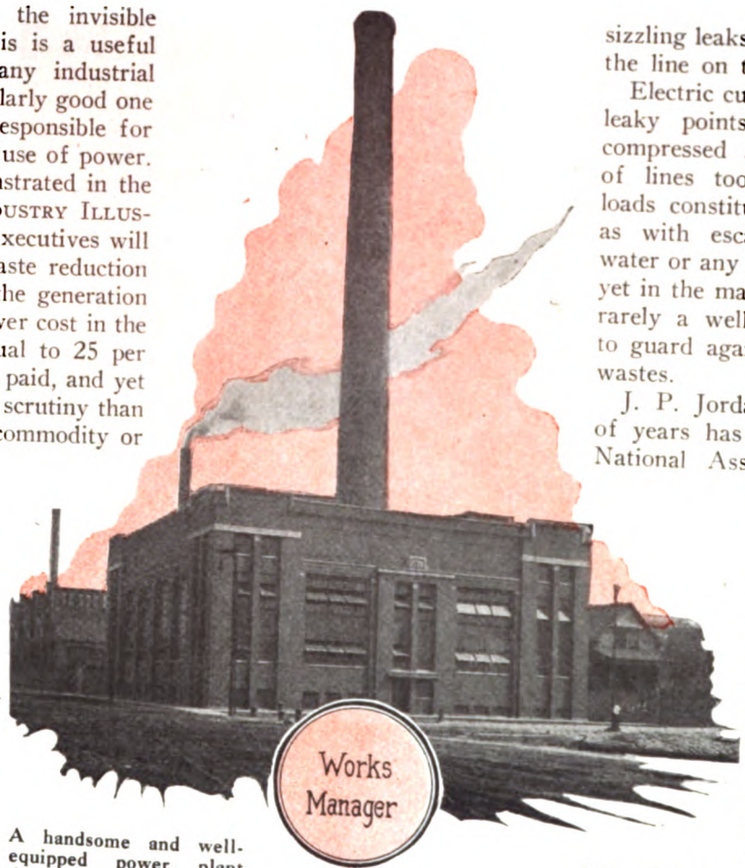
It was clearly demonstrated in the preceding issue of INDUSTRY ILLUSTRATED that industrial executives will find a rich field for waste reduction and profit building in the generation and use of power. Power cost in the average industry is equal to 25 per cent. of the total wages paid, and yet as a rule it receives less scrutiny than the cost of any other commodity or article manufactured in the plant.

From the standpoint of executive control, probably the various services supplying necessary wired and piped energy or supplies have received but the most scant attention in the majority of plants. If a steam line finally heats a distant department, that has seemed to be the whole objective; never caring how great is the loss in transmission. If a machine requires compressed air and gets it, scant thought is given to the sizzling leaks that may be heard from the line on the way to the machine.

Electric current cannot sizzle from leaky points as can the invisible compressed air, but the resistances of lines too small to carry their loads constitute just as great a loss as with escaping air, steam, gas, water or any other such service. And yet in the majority of plants there is rarely a well organized jurisdiction to guard against all such losses and wastes.

J. P. Jordan, who for a number of years has been president of the National Association of Cost Accountants, presents to the readers of INDUSTRY ILLUSTRATED a plan for checking power wastes through organization. The diagram at the bottom of the page illustrates his simple assignment of duties and responsibilities which, if carried out, will run down the power profit eaters, make them visible and thus make possible their extermination.

Have you such a definite assignment of duties in connection with power? It will aid you in doing away with some of the invisible wastes graphically portrayed on the opposite page.



A handsome and well-equipped power plant does not always mean efficient operation. In a plant covering large area the loss in transmission of steam is heavy, and the cost of insulation high.

Definitely fixing the responsibilities of the power superintendent aids in discovering and eliminating the invisible power losses.

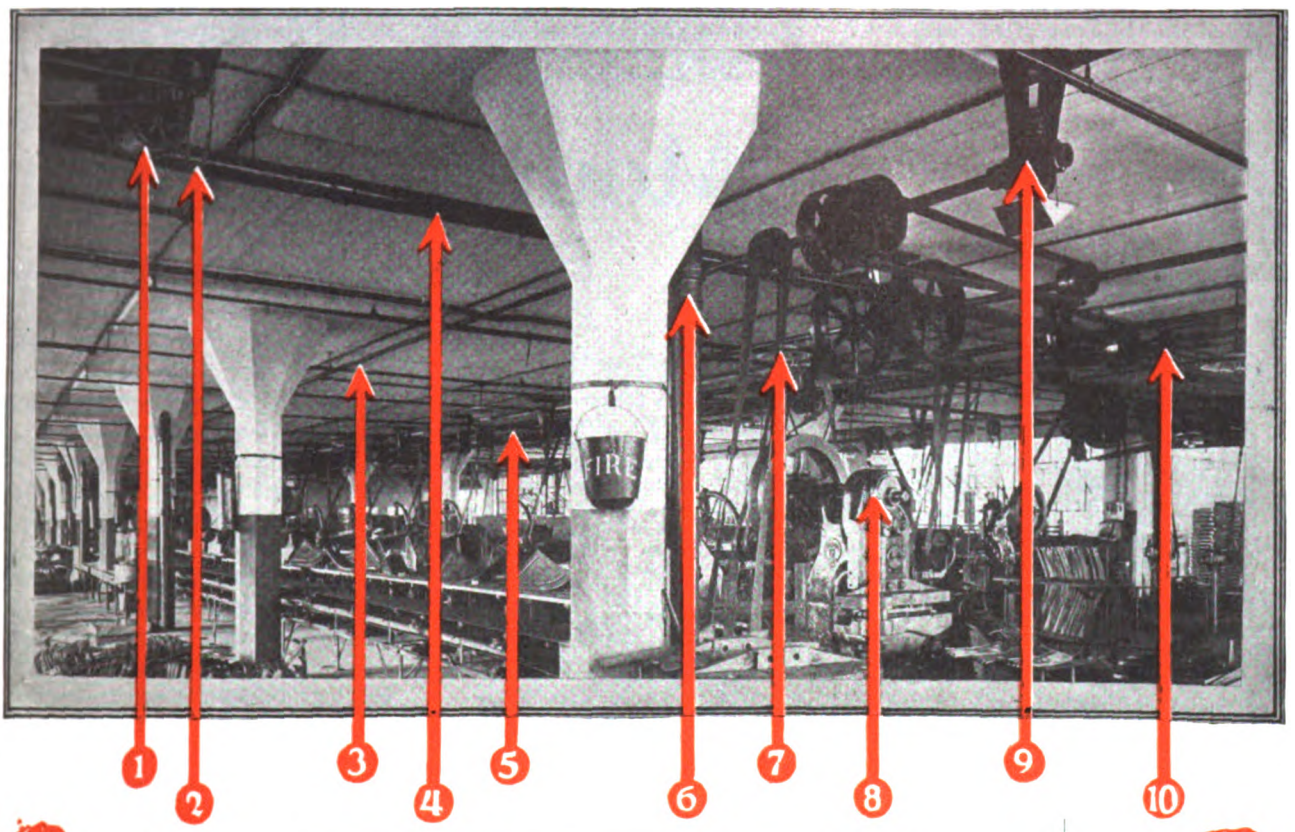
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THE photograph which is reproduced below depicts a typical shop interior. One cannot tell by looking at it or from visiting a similar shop that ten or more profit eaters are probably busily at work boosting the cost of power.

The task of the executive in organizing to reduce power costs is to provide a means to reveal the presence of these profit eaters, and they are by no means the only ones which infest the utilization of power. They are chosen here merely because they form a striking example of the losses which may and do occur unseen and unchecked in thousands of American industrial plants and which continuously nibble away at the profit statement.

The fixing of responsibility for determining these losses is purely a function of the executive, a function which in many plants is not properly appreciated.

Electric power, whether generated or purchased, steam, compressed air, water, gas, coal, and oil, individually and collectively attract specific power eaters of this sort. Most of them are invisible. They must be hunted down through the medium of organization and proper cost methods.



1 Wrong type of motor or wrong size of motor for the job boosts power consumption.

2 Wiring too small for current carried causes heavy line losses.

3 Leaks in compressed air lines often double the loads on air compressors.

4 Radiation from uncovered steam pipes compels large waste of coal.

5 Incorrect alignment of line shafts increases the friction load.

6 Leakage or unnecessary use of water makes pumps work harder. The firm foots the bill.

7 Belt slip puts a power poll tax on the profit sheet.

8 Poor lubrication of machine bearings makes you pay for what you don't get.

9 Poorly designed and poorly lubricated line-shaft bearings help to raise the coal bill.

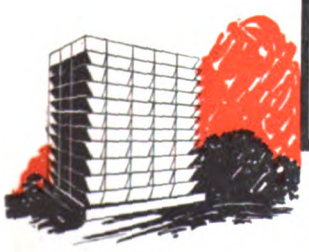
10 Shaft couplings out of true eat profits at every revolution.



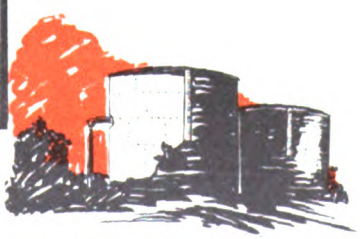
Compressed air costs money. Dull tools, leaky hose and fittings and carelessness in use make it more expensive.



Gas torches are left burning while not in use. Foot pedal operating valves save this waste.



Water is nature's gift to man but industry pays for the privilege of using it. Do you know your water costs?



A leaky, underground oil delivery line cost one concern thousands of dollars before it was discovered.

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Fig. 1. Individually hot pressing balls from steel slugs automatically heated and fed. By this method, a ball of one inch diameter is formed at the average rate of 2 seconds.



Fig. 2. Cold pressing small balls. These automatic machines rapidly press chrome alloy steel into balls of uniform size. All steel is previously inspected to eliminate the least defect in quality.



Fig. 3. Forging balls in groups, sizes over ⅛ inch. Hot forging of slugs, such as these, is followed by annealing. These rough spheres are then ground to size.

Modern Ball Bear

Combining Precision With

By J. F.

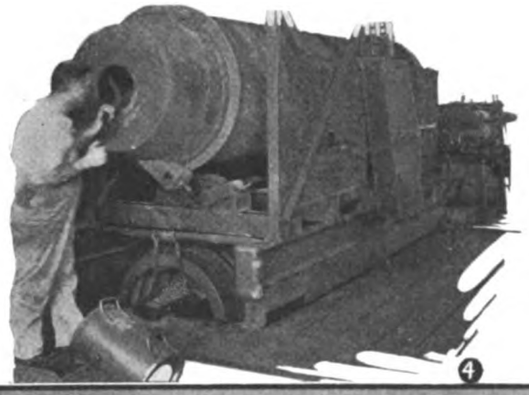


Fig. 4. Hardening. Helical grooves roll balls slowly forward from cool end of rotary furnace into gradually increasing heat. Hot balls are discharged into screen suspended in water tank, then automatically lifted out.

WIDE application of ball bearings began in the nineteenth century. The bicycle craze of the last decade of that century was made possible largely because of the great reduction in friction in the three principal bearings. The mechanically inclined all over the world became acquainted with the use of steel balls in journal bearings. The automobile followed the bicycle, and the enormous development of pleasure car and motor truck has been responsible in large measure for the further development of the manufacture and design of the present type of ball bearings.

Consider an ordinary radial bearing consisting essentially of two rings with shallow circular grooves and a lot of balls interposed between the two grooves. Such a bearing may be installed in two ways: (1) It may be so fitted and put in place that both rings will be mounted in fixed positions, the one secured on the shaft and the other se-



Fig. 5. Battery of rough grinding machinery.

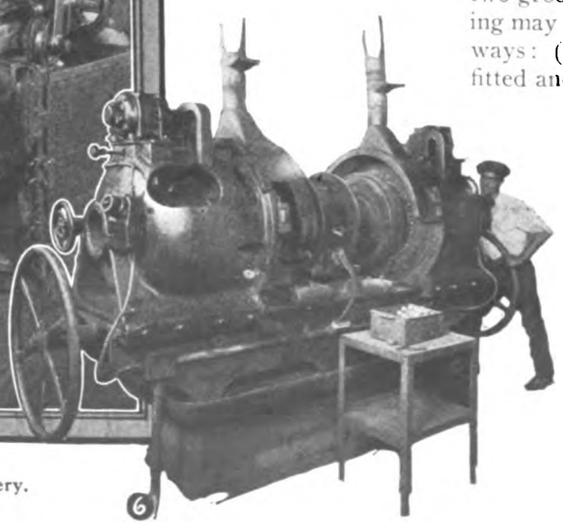


Fig. 6. The illustration shows the first or rough grinding operations after the balls have been hardened. This machine allows metal to be removed much more rapidly than in subsequent operations of grinding.

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Fig. 7. One type of special machine for rough grinding steel balls. In this operation it is essential that ball sphericity be kept within close limits, so as to maintain accuracy in the finishing operations.



Fig. 8. These special machines for oil-grinding steel balls permit extreme accuracy and fine finish of the ball surface. It is one of the first operations of the finishing series.

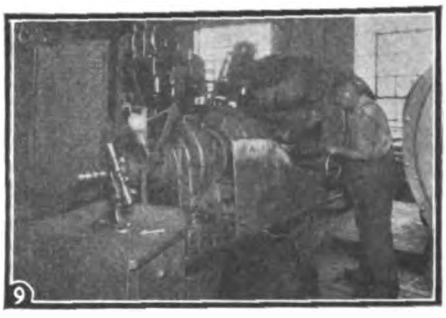


Fig. 9. The Hoffman grinding machine for final finishing of steel balls. The balls automatically pass between grinding wheel and grooved cast iron plate, permitting intermixture of large quantities of balls.

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cured in the housing. (2) It may have one ring fixed and the other so mounted that it is free to slide in the direction of the axis of revolution. This latter style of mounting gives us a bearing whose function is strictly limited to radial loads. When a thrust occurs, the bearing does not resist it. In the former mode of installation, however, a thrust will be resisted, so that thrusts of a very moderate character will be cared for as well as the radial load for which it is especially adapted. Along a diameter, the ordinary radial bearing has four points of moving contact, so that there are at four points four opportunities for "play." If the bearing is so mounted as to have one ring free to slide, we have altogether six points at which "play" must be provided for. Doubtless, when the load is on, the closing up at one point may be balanced by an opening up at another; but all the same if housing and shaft are to have a minimized amount of "play," as it were, there must be a very close fit of the balls in the raceways. This means that the bearing must be constructed with extraordinary accuracy.

Consider a moment. A ball is said to have a diameter of, say ½ inch (=0.5000"). But, how many diameters has a ball? Evidently, an indefinite

(Continued on page 80)

Fig. 10. Polishing steel balls in tumbling barrels. These balls are put in with small strips of soft polishing leather and continually tumbled for hours until a mirror-like finish is obtained.



Fig. 11. Automatic gauging of finished steel balls as they consecutively roll down inclined knife edges angled slightly so balls drop through at point coinciding with ball diameter. Detects variations from normal size to within 5/100,000 of an inch plus or minus.



Fig. 12. Operator gauging extra large and special steel balls in extremely accurate instrument known as the Minimeter. Its entire range is only 2/1,000 of an inch, and indicates variations as close as 25/1,000,000 of an inch.

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Taking Clowns Off the Payroll

One of the First Steps Toward Accident Prevention

By George W. Gray

IN a Detroit factory two years ago a fellow workman in a spirit of fun turned the nozzle of the compressed air hose on an employee who was stooping over his work. The bowel was immediately inflated beyond its elastic limit, it ruptured, and the man died in a few minutes.

Shortly afterward the same ghastly joke was played in an eastern plant. One of the workmen at the noon lunch time was leaning out of the window, watching others at play in the yard, when a simpleton who didn't mean any harm tiptoed up to him with the air hose. In this case the patient lingered two days before death mercifully relieved his suffering.

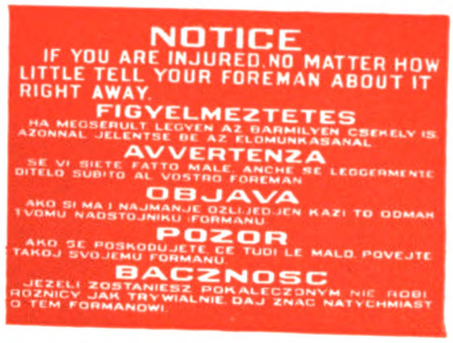
The joke takes many forms. Sometimes the air is turned in a man's face, sometimes directed at his ear. Another stunt is to "blow the cobwebs" out of his hair. It is always risky, and playing with compressed air should be put in the same class with playing with fire.

Air suction can cause trouble just as serious as air pressure, as the shop clown has demonstrated on more than one occasion. In a barrel factory in the vicinity of New York occurred one of these "humorous" accidents not long ago, in which the business end of a vacuum cleaner became for the time being a deadly weapon.

In this case the jokester applied the vacuum cleaner to a fellow workman's back, where it stuck for several minutes. The author of this bit of humor and his gallery of lookers laughed hilariously as the victim twisted his back and shook himself, trying to get free of the machine. He finally got loose and took the thing good naturedly, laughing with the others. In the evening he began to feel pains about his spine. The following morning he was taken to a hospital. There the surgeons found that the powerful suction had pulled his spine out of joint. He died a few days later.

Another form of amusement that is too common is the live-wire joke. In this case an electrical wire is arranged, innocently enough, perhaps connected with a pipe wrench or some other heavy tool, and the victim is asked to go get the tool. The electrical shock need not be of killing power in order to cause serious injury. In some cases the shock has caused the victim to jump or stumble and injure himself in falling, or to drop the tool on his foot.

The schoolboy antic of tickling is prolific of shop accidents. One manufacturer found it so serious in its results that he had his safety department prepare a special bulletin featuring a case in which a man who was fooling with the time-clock was tickled by the man behind him and suffered a broken rib in the scuffle that followed.



"We expect boys and puppies to play, but men should know better"



says a striking poster warning against this kind of horseplay, which is prepared by the National Safety Council. "Someone has suffered in proving the need for each safety rule."

Not only does this tomfoolery kill time, distract the attention of many men from their work, and undoubtedly impair production, but very often it dulls the spirit and destroys the goodwill of the victim. Many a job suicide results from hazing.

Playing with fire is so ancient a hazard, is so universally preached against, and the toll of its losses and victims is so great, that one would expect it to be extinct. It is far from being extinct. Every day men light their cigarettes with gasoline torches. Riveters have been known to use a red-hot rivet for the same purpose.

What is the remedy? How may an employer guard against paying out wages for clownish services that are not wanted? Is there any way of eliminating the practical joker?

Answering all these questions at once — the only remedy, safeguard, and eliminating device that we know is the two-fold one of (1) education, and (2) physical exercise.

Education means campaigning against practical joking. It is not enough to campaign for safety first. That is too general an objective. The practical joker never thinks of himself as careless—not until the ambulance arrives. He rarely associates his activities with those of the careless watchman who leaves the elevator well open or the thoughtless machinist who fails to use a safety guard. So when you campaign simply for Safety First, the idea does not get across to the humorists at all.

Many companies have found it desirable to direct a special campaign against practical joking. The period just before April first is an appropriate time to stage such a drive. The means used include posters, special bulletins, articles in the plant magazine, and meetings of the work force, at which speeches are made by the safety engineer, company physician, superintendent, foremen, and others.

All these publicity devices must be very specific and concrete, warning the men against definite acts of fool-

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ery, telling them convincing stories of accidents and losses resulting from such pranks, and putting the thing squarely on a mutual basis—calling upon every man in the organization to coöperate in stamping out the abuse for their mutual welfare.

For the purpose of making this educational plan specific, it is necessary to draw up a list of the things that are tabu. Such a list may be as detailed as you please, the more detailed the better. Perhaps every plant executive will be able, from his experience, to add

















items to the list.

Of course a campaign should be followed by supervision, to enforce the safety rules with regard to all these practises and discipline strictly any person who violates them. The plea that "it was just for fun" should never be regarded as an excuse for a prank that has been specifically listed as a "don't." Employees must be made to understand that their exuberant spirits must find an outlet elsewhere than in the workrooms, and funmaking must find victims other than their fellow employees while at work.

Which brings us to the second element of our remedy, physical exercise. Psychologists say that the underlying cause of such pranks and foolishness as make grown-up men seem like thoughtless children is an excess of energy that must find vent in some way.

Here you have a real reason for the plant baseball team, factory athletics, gymnasium and other recreational facilities. Specialists report that the provision of these facilities to the working force of a plant has a very definite influence on the conduct of the men while at work, an influence proportionate to the number of the employees who use the recreational opportunities provided. Theoretically, therefore, a plant in which the employees were 100 per cent. enlisted in baseball teams, handball games, basket ball matches, bowling, tennis, gymnasium exercises, and other after-hours play activities involving muscular exercise, ought to be 100 per cent. free of play during working hours.

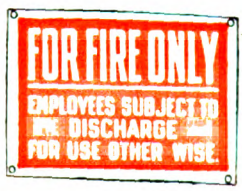
How to promote such activities is of course a subject in itself, and we can only say in closing that they are generally most successful when developed and carried on by the employees themselves. In order to get the benefit of recreational sports, the company does not have to build a gymnasium or directly promote a series of athletic teams. Frequently the offer of a trophy or other prize for excellence in sports is sufficient to stir up initial interest. The competition of athletic teams of other factories is another stimulant. The company can encourage its employees in these directions by offering to provide the necessary uniforms and by having an annual banquet, field-day, or other celebration, devoted mainly to the athletic activities of the personnel, at which trophies are awarded and the teams are made the center of interest.

There are, of course, other benefits accruing from company athletics. They help to promote company spirit or loyalty, they help to knit the personnel closer together in a feeling of fellowship, and, as some concerns have found, they are no mean sort of advertising when they produce winning teams at inter-company competitions. But apart from these considerations is the benefit that we have featured in this article—their service as safety valves for the release of excess animal spirits, thus sublimating the jokester into the athlete.

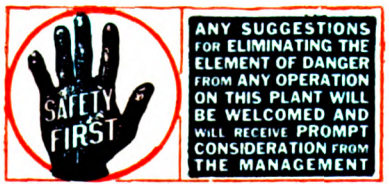


Like every other educational campaign, the mere posting of one sign and making of rules is not sufficient. Nor is it sufficient to frown upon jokesters and to attempt to create an atmosphere of strict attention to business. The incorrigible joker should by all means be eliminated from the payroll; but the average factory clown needs only a firm hand and an understanding mentor to turn him into a good natured producer. By athletics, by a general stimulation of team spirit, and by intelligent personnel work it can be done.











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Better Lighting Means Better Work

How Your Central Station Can Help You

By Thomas G. Ward
Lighting Engineer, Detroit Edison Company

EVERY manufacturer pays for good lighting.

No, this does not mean that every plant is well or properly lighted, by any means; it means that those manufacturers whose plants *are* properly illuminated get what they pay for and more; while those whose plants are *not* properly illuminated pay in terms of lowered production, accidents, and spoilage.

In one large Detroit plant, for example, we conducted tests over a period of one year, using different intensities of illumination ranging from that provided by localized lighting alone to 18 foot-candles. The production curve, in the meantime, rose steadily in keeping with the improvements made in the illumination, and by the end of the year had mounted from 70 to 98.5, showing an actual increase in production of approximately 36 per cent., while spoilage and accidents were reduced proportionately.

In another plant, a machine shop, improving the illumination increased production a fraction over 25 per cent. and reduced spoilage, from a figure so high that the management prefers it be not quoted, to a minimum. The president of this company has stated for publication that increasing the illumination in the plant enabled the company to earn a profit on smaller sales than those on which it had just previously taken a loss.

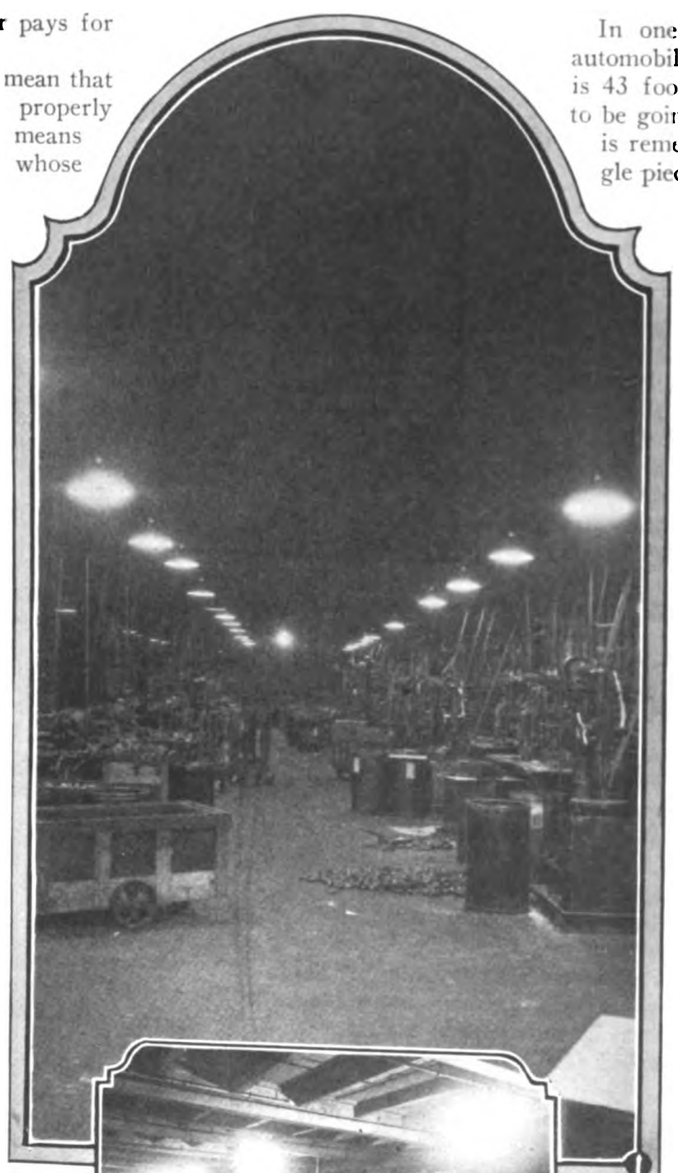


Fig. 1. A machine room lighted to an intensity of 15 foot-candles by lamps in R.L.M. dome reflectors.



Fig. 2. A printing shop as lighted by gas. Contrast this with Fig. 7.

In one department of a Detroit automobile plant the lighting intensity is 43 foot candles. This may seem to be going to extremes, but when it is remembered that spoiling a single piece in this department would more than offset the cost of maintaining this intensity for a month, one must agree that the management is acting wisely.

By way of contrast, another manufacturer was using a candle to shine a light into one end of a tube in the testing laboratory. The candle was very economical, but one day it was upset, ignited some acid, and destroyed a very expensive machine.

A large insurance company had stated that at least 18 per cent. of our industrial accidents today are due to poor illumination; no inconsiderable item when it is remembered that industrial accidents mount high into the hundreds of thousands every year.

Every central station, lamp manufacturer, and manufacturer of commercial and industrial lighting units now maintains a corps of lighting engineers whose sole duty it is to coöperate with customers to the end that they may have the best possible lighting at the lowest possible cost. These engineers analyze lighting problems and make recommendations, but they have nothing to sell. They recommend types of lighting units and lamps, but they recommend no particular manufacturer's product and they rec-

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ommend no particular contractor to do the wiring or other work. In a word, they are disinterested consultants whose one aim is to improve the lighting in the plants and business places of users of current.

As a member of the lighting division of the Detroit Edison Company, I personally serve an average of about one plant a day in such a capacity. Many jobs of course require weeks, while others require only a few hours.

We have done a great deal to improve the lighting of Detroit plants, but we are just getting well started, and some of the conditions which we still find are actually astonishing.

It is hardly believable that any manufacturer would tolerate unshielded drop lamps in his plant in this day of efficient lighting, yet many do. Just recently I was called into a plant where I found workmen holding the "drops" with one hand while they operated their machines with the other. The drops were without reflectors and were not properly spotted, thus forcing the workmen to hold them much of the time, both to keep the glare out of their eyes and to shine the light where they needed it. Had this manufacturer had proper lighting in his plant, he might have employed one-armed men to equally good advantage!

In another instance I was called in because the lamp breakage was so high as to cause concern. It was not because the unit was improperly placed that I was called in, mind you, but because the management had grown tired of buying so many lamps to replace broken ones. I found that the only light at the machine where the breakage was occurring was a drop, which the workman had attached to a part of his machine which steadily rose and fell. There was an unshielded electric lamp, bobbing up and down before the workman's eyes all day long, but this had caused no one any concern; it was the breakage that had finally spurred the management to action. After I had recommended proper reflectors, with bowl enameled lamp, on each side of the machine, the operator said if he had had this arrangement for the past four years, he wouldn't have been wearing glasses and wouldn't have lost so much time because of headaches.

In this connection, it would be amazing to know how many heads are aching every day because of eye strain, due to improper lighting! In perhaps a majority of cases, even the victims themselves do not suspect the cause. I recently observed a woman working on fine copper wire under a bare lamp, for example, and when I asked her whether she were troubled with headaches, she

(*Continued on page* 90)



Fig. 3. Above, in the oval — would you care to spend eight hours a day under such conditions?

Fig. 4. Modern "daylight" lamps in a color printing establishment. The same room is shown in Fig. 6, as formerly lighted.

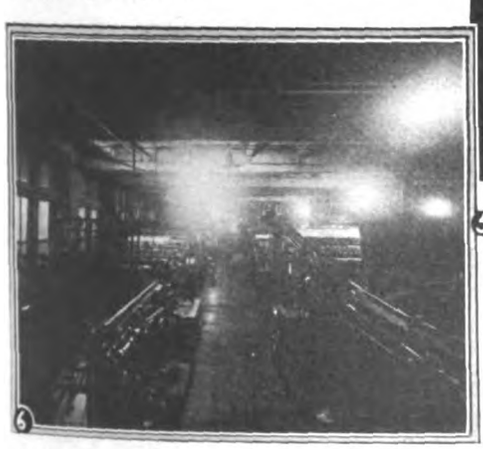


Fig. 6. Color printing establishment (shown in Fig. 4) as it appeared under the old gas lights.



Fig. 5. Eye-strain means not only spoilage, it means illness and lost time and discouragement.

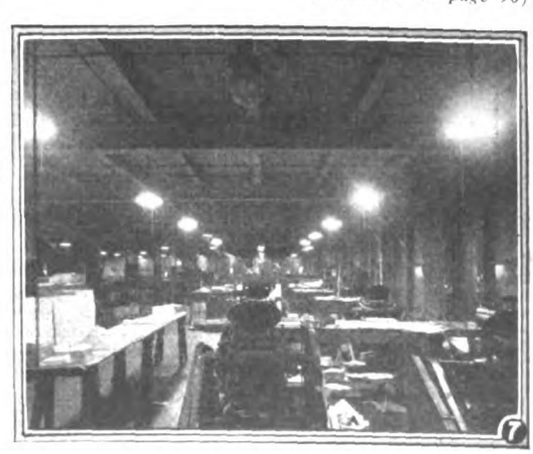


Fig. 7. In contrast with Fig. 2, note here the even distribution of light.

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Fighting Friction in the Power Plant

What Management Should Know About Lubricants for Prime Movers

By Allen F. Brewer

PACKING, gages, pipe covering, etc., all are decidedly advantageous in bringing about increased efficiencies in power plant operation, but none of them are absolutely essential. The average steam engine, for example, could probably run, after a fashion, if they were all omitted; but do away with lubrication and in all probability it would groan, buck and ultimately stop.

Therefore, lubricants can be quite properly regarded as on a par with fuels, as vital necessities in power plant operation; for the transformation of energy requires motion and motion involves friction. Friction, in turn, naturally gives rise to heat and wear, both of which have a decided cumulative tendency.

To avoid these objectionable features, modern practice endeavors to supplant solid friction as far as possible with fluid friction. This can be economically accomplished only by the introduction of a lubricant between the moving surfaces which will maintain a continuous oily, fluid film of suitable thickness. But while this lubricating film must be thick enough to prevent actual contact between the metallic surfaces involved, it must not, however, be so thick or viscous as to develop excessive friction within itself or between its component particles, otherwise it would not be fulfilling its purpose to the maximum possible extent.

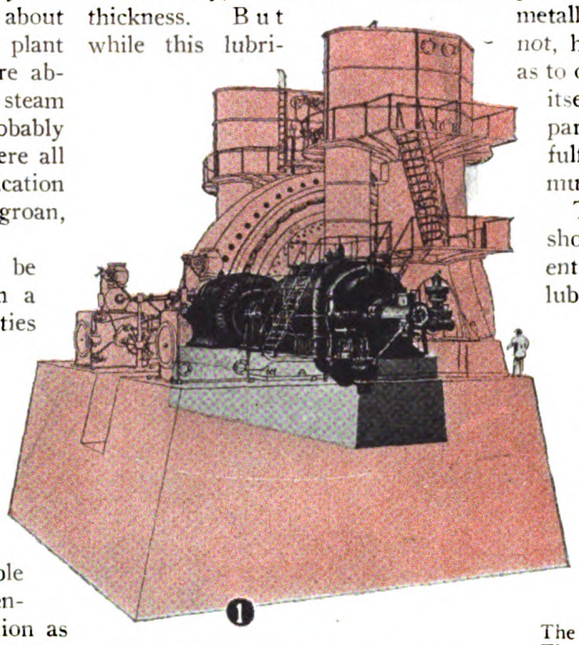


Fig. 1. Comparative sizes of the steam turbine and reciprocating engine. Inherent lubricating problems are almost in the same proportion.

The power plant management should know more about the salient properties or characteristics of lubricants in general, which would indicate the extent of their fitness for service on the usual prime movers installed. These latter, as applied to the transformation of the latent energy of our natural resources, such as coal, water power, and gaseous and liquid fuels, into mechanical or electrical energy, comprise

The reciprocating steam engine,
The steam turbine,
The hydro-electric or water turbine, and
The oil engine.

In construction and operation, each of the above differs so widely from

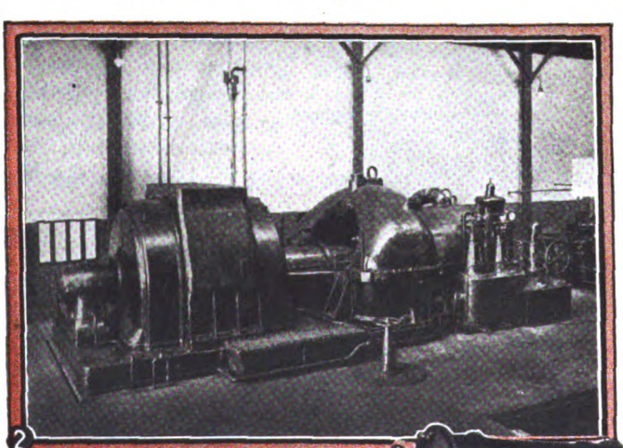


Fig. 2. The compactness of the steam turbine is well brought out in this illustration. Its enclosed lubricating system makes for very efficient lubrication provided the right kind of oil is used and it is maintained in a suitable state of purity.

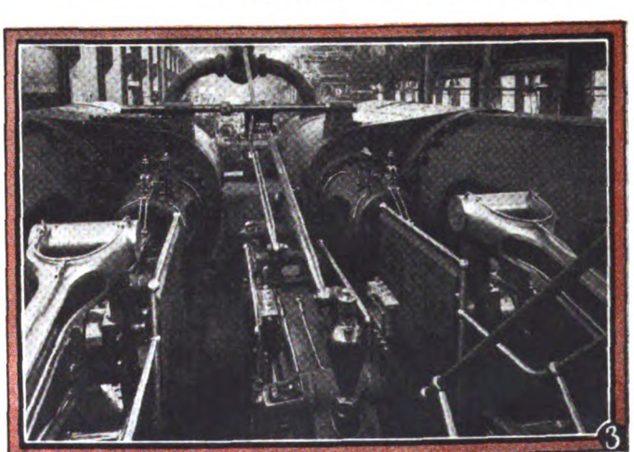


Fig. 3. The valve gear and reversing mechanism of a reciprocating steam engine showing clearly the essentials of the lubricating system.

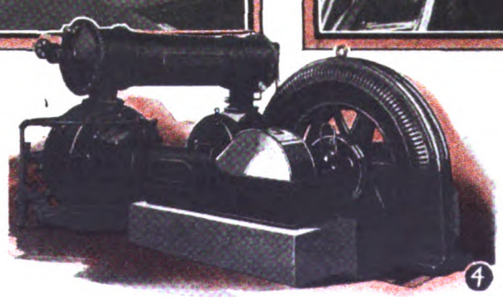


Fig. 4. The air compressor is one of the most important auxiliaries in the power plant, and its lubrication requires very careful attention.

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the others, that naturally lubrication becomes a specific problem in each instance. Constructional features, of course, are known to all. The several operation conditions such as speed, power, manner of installation, pressure, temperature and intelligence of the operators, and the extent to which lubricants must be prepared to conform to them, however, are worthy of detailed discussion. In general they are given altogether too casual attention, and their importance in the attainment of lubrication economies overlooked. To meet these conditions, power plant lubricants must be refined in accordance with certain standard specifications which are indicative of the properties which such products should possess. In general these include:

The viscosity or relative fluidity,
The pour test,
The flash point,
The fire point,
The Baume gravity,
The fixed oil content,

(*Continued on page* 38)

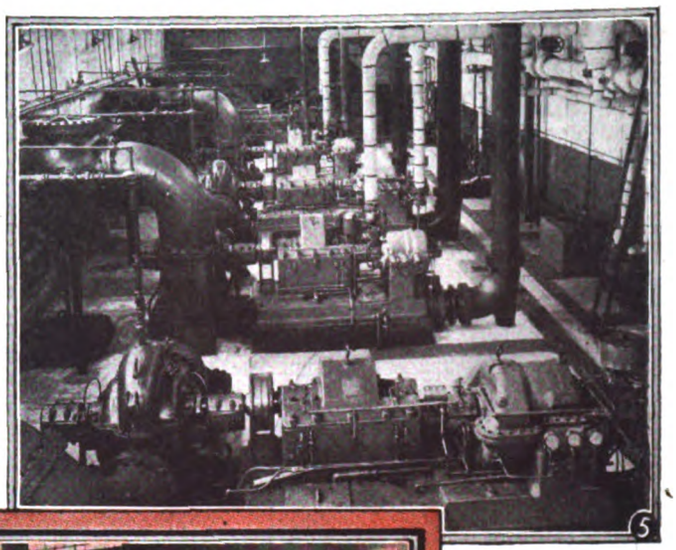


Fig. 5. The pump house of a modern industrial plant, showing a set of turbo-driven centrifugal pumps. Where the pumps essentially keep the plant running, it can be appreciated that their prime movers—the turbines—must not fail, nor will they if properly lubricated.

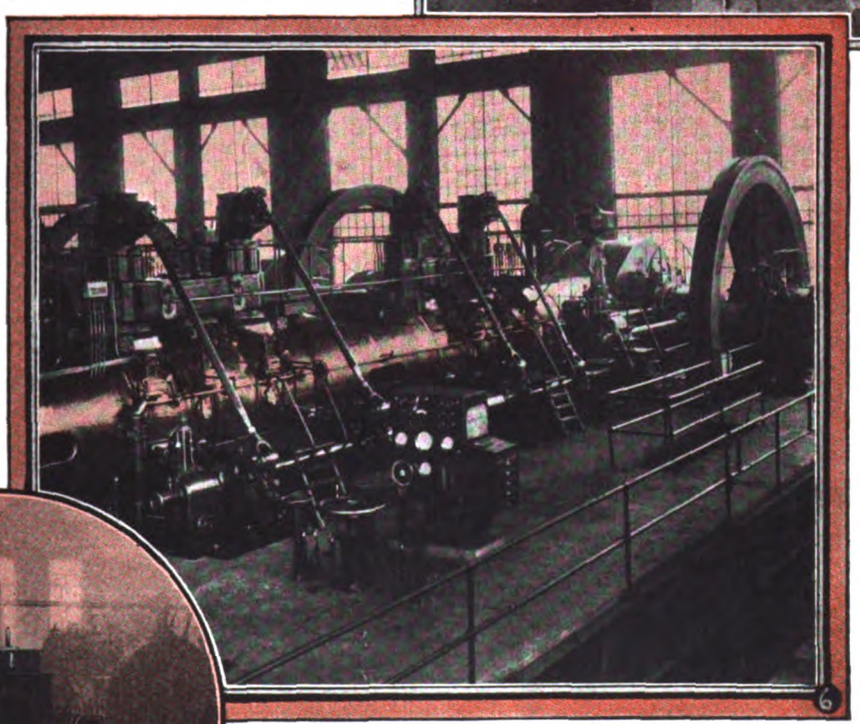


Fig. 6. A gas blowing engine installation of the una-flow type. Lubrication of engines of this type is somewhat more detailed than the lubrication of the ordinary reciprocating engine. In this case the numerous lubricating leads, etc., can be readily seen.



Fig. 7. Purification of the lubricants used on engines of this type is very essential. This illustration shows a modern oil filter installed for this purpose.

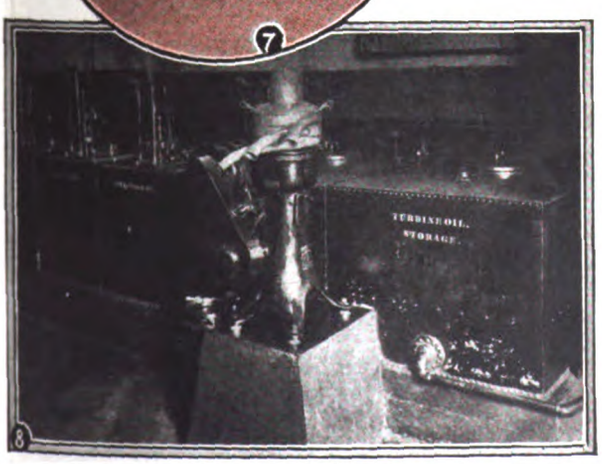


Fig. 8. In lieu of a filter, the centrifugal oil separator can be used as a means of suitably purifying the oil.

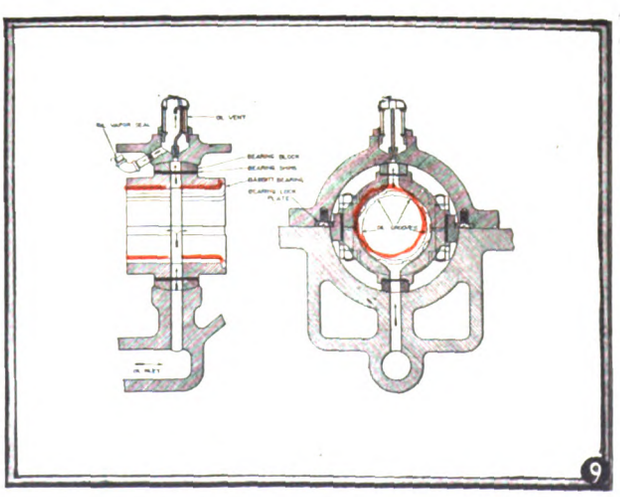


Fig. 9. The method of lubricating the main bearings of an air compressor, showing the path taken by the oil in its circulation.

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The Industries of Sweden

A Small Country and Its Intelligent Cultivation of Resources

By A. Bogenholm Sloane.



Fig. 1. Marking trees which are to be cut down. Only where trees stand too close together, or where they are injured, are they cut. There is no such wanton destruction of timber resources as has depleted our American forests.

IN Sweden, at the present time, industry and agriculture are of about equal importance. Only about fifty years ago, 72 per cent. of the inhabitants lived by agriculture, and about 15 per cent. by industry, while today only about 40 per cent. of the male population are farmers, while an equal proportion of the population is engaged in industry.

Swedish industry is founded on the great natural resources of the country: — forests, iron ore, and water power. On the basis of these natural resources and the products of agriculture, an industry has developed which is of great importance in relation to the size of the country and the number of its inhabitants. Although a number of the Swedish industries may be considered as world industries, it is not, as a rule, mass production but the all 'round high quality of the finished and of the half-finished products manufactured, that is the main feature.

The principal Swedish industries are the timber, cellulose and paper industries, and the iron and steel industry. Besides these, there are important mechanical industries, with a large export of various kinds of products, especially cream separators, ball bearings, electrical machines, and gas accumulators. Further may be mentioned the well known manufacture of matches, chemical industries of different kinds, ship building,



Fig. 2. Lumber is one of the big industries in Sweden; as evidenced to most of us primarily through the well known "made in Sweden" matches.



Fig. 3. Water power development is a live topic, and Sweden has already developed over 1,200,000 hp. of an estimated 6,200,000 readily available for development.

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cement industry, glass industry, and the textile industry.

Owing to the fact that the natural resources are for the most part concentrated within different districts of the country, these special industries will be found within more or less limited areas. The timber, cellulose and paper districts are mainly situated on the coast of North Sweden and along the rivers which serve as logging channels for the vast pine and spruce forests of the country. The districts of the iron and steel industry and of the mechanical industries are located in the central parts of the country, where rich iron ore deposits in conjunction with neighboring forests and waterfalls form a good basis for these typically Swedish occupations. The other industries mentioned above will mostly be found in the south of Sweden, in the thickly populated agricultural districts.

Great portions of the products of the Swedish industry are, of course, consumed at home, but Sweden is also an important exporting country. Nearly one half of the exports go to Anglo - Saxon countries. During the last few years the exports to the U. S. A. have increased considerably.

As early as the Middle Ages, Swedish iron was exported on a large scale to the South of Europe. The exportation of wood products began in more recent times. Industries for the exploitation of the raw material began in the 19th century. The iron and timber industries, however, are still the leading export industries of Sweden.

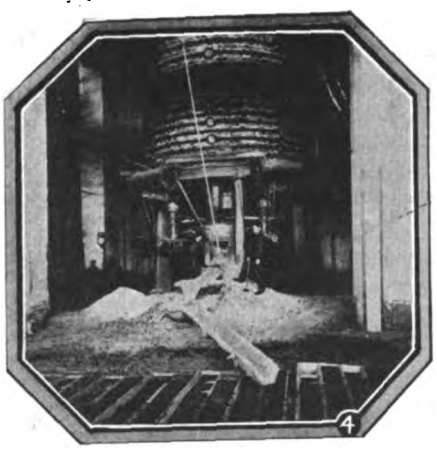


Fig. 4. This modern charcoal kiln is a far cry from the old time charcoal burners.

Yet, the very oldest Swedish industry of any consequence, the copper industry, will be found in a sphere of activity where America may be said to have continued work where Sweden left off. As early as in the beginning of the 13th century a rich copper mine was discovered in the province of Dalecarlia, in Central Sweden, near the present city of Falun. That was the Great Copper Mine (Stora Kopparberget), destined to play such an important part in Swedish history. For centuries, great quantities of copper were obtained from this mine, not only for domestic consumption but also for export to other countries. It was the wealth of this mine which laid the financial foundation for Sweden's position as a great power in the 17th century. In the 19th century, the copper resources began to become exhausted, and almost simultaneously the exploitation of America's immense copper deposits commenced.

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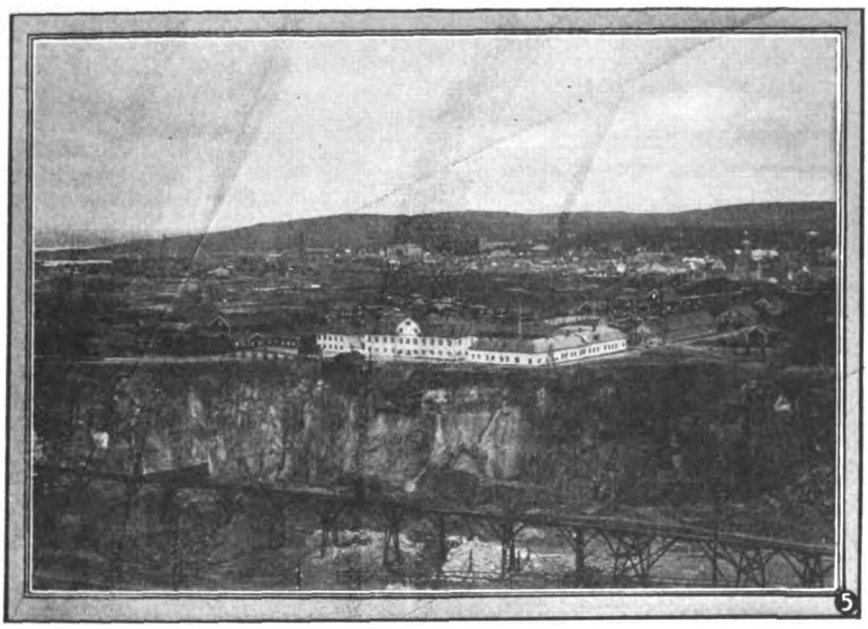


Fig. 5. The basis of one of the oldest of Sweden's industries—the great copper mine, in Central Sweden.



Fig. 6. Loading sawn wood for shipment. One of the richest countries, in forest land, of Europe, Sweden has for years practiced forest conservation.



Fig. 8. With its forest resources, Sweden has developed a sizeable paper industry which supplies both domestic and foreign trade.



Fig. 7. Iron and steel—as American tool makers know—form an important part in Sweden's contribution to world industry.

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Who Pays the Fire Demon?

Our Immense Annual Fire Loss, and How We Can Combat It

HENRY FORD is generally credited with receiving the largest income of any man in the world; yet even his immense income fades into insignificance beside the "income" enjoyed by our old arch-enemy, the Fire Fiend. In 1923 for example, it was 508 million dollars; over the past decade the loss averaged a quarter-billion dollars annually. These figures, of course, are for the United States alone. Not only do we lead the world in this unenviable distinction, but our fire losses are steadily increasing, year by year.

Who pays this bill? Not the insurance companies, not merely the ones who suffer the direct loss, but all of us. We pay in higher insurance rates, in inconvenience, in a score of ways indirect but none the less real. Instead of confining fire to its legitimate place as man's most useful servant, we—by our own carelessness and criminal negligence—permit the Fire Demon to become our master and to levy daily tribute.

Chief Kenlon of the New York fire department, who is well qualified to know, states that at least 75 per cent. of all fires are due to two things: ignorance and carelessness. In other words, three out of every four fires never should have occurred. In a country which prides itself upon efficiency of methods, carelessness has no excuse; in a country where education is available to everyone, ignorance has no place.

What, then, is the logical way to combat the growing menace; how reduce the staggering losses due to fire?

First, we must realize that insurance does not compensate for destruction; it merely spreads the loss over a large number of premium-paying individuals. And, while adequate fire insurance is a sane and necessary protection, it should not be considered—as it too

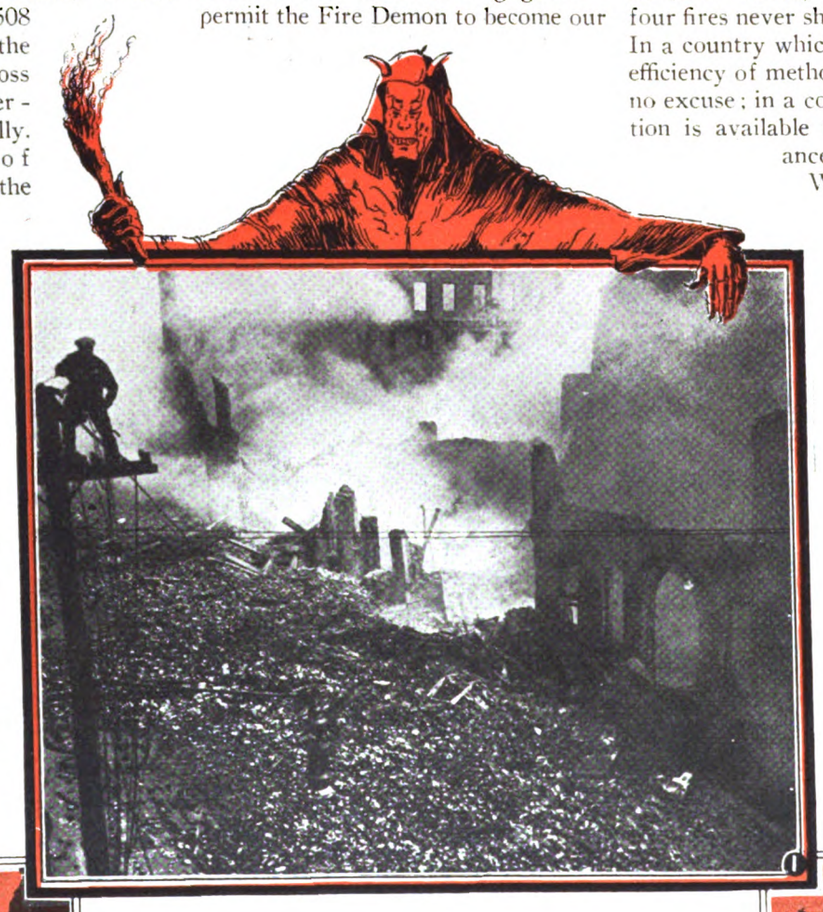


Fig. 1. At the right—the Jersey City fire, of unknown origin, which laid waste over a million dollars' worth of property in November, 1924.



Fig. 2. Another explosive fire, where a three-story brick building was destroyed; though good work by the firemen prevented its further spread.



Fig. 3. This fire started in a room where feathers (for pillows) were fumigated—and developed into a three-alarm affair.



Fig. 4. The remains of a "fire-proof" building destroyed in less than an hour, by fire starting in waste-paper storage bins.



Fig. 5. Here, a building immediately adjacent was saved by its automatic sprinklers, an outside sprinkler protecting the rear wall.

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often is—the beginning and the end of fire precautions. Much more important are the other two angles: fire *prevention*, and adequate provision for fire *fighting*.

Every year, we have a Fire Prevention Week, during which the schools, the press, motion picture houses, and the radio—all coöperate in trying to awaken the people to the fire menace and instructing them in fire prevention work. What we really need is to make *every* week Fire Prevention Week, instead of devoting one week of each fifty-two to this campaign; for the Fire Demon is busy every week — every hour of every day.

Obviously, we cannot scrap every structure which is a fire risk; we cannot abandon the everyday use of gasoline and other inflammable but highly useful products; we cannot abolish manufactures which, though highly dangerous from the fire standpoint, are necessary to our well-being. But we can, by

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Fig. 6. Only a high-pressure city water system and an efficient fire department saved this building. And the fire started, inconspicuously, on the third floor.





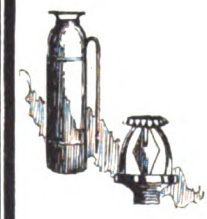


Fig. 7. Only very rarely does fire get the upper hand if a building is properly equipped and then only through carelessness or neglect of inspection.



Fig. 8. The proximity of plenty of water often lends a false sense of security. Fire prevention is worth many times more than subsequent fire fighting.

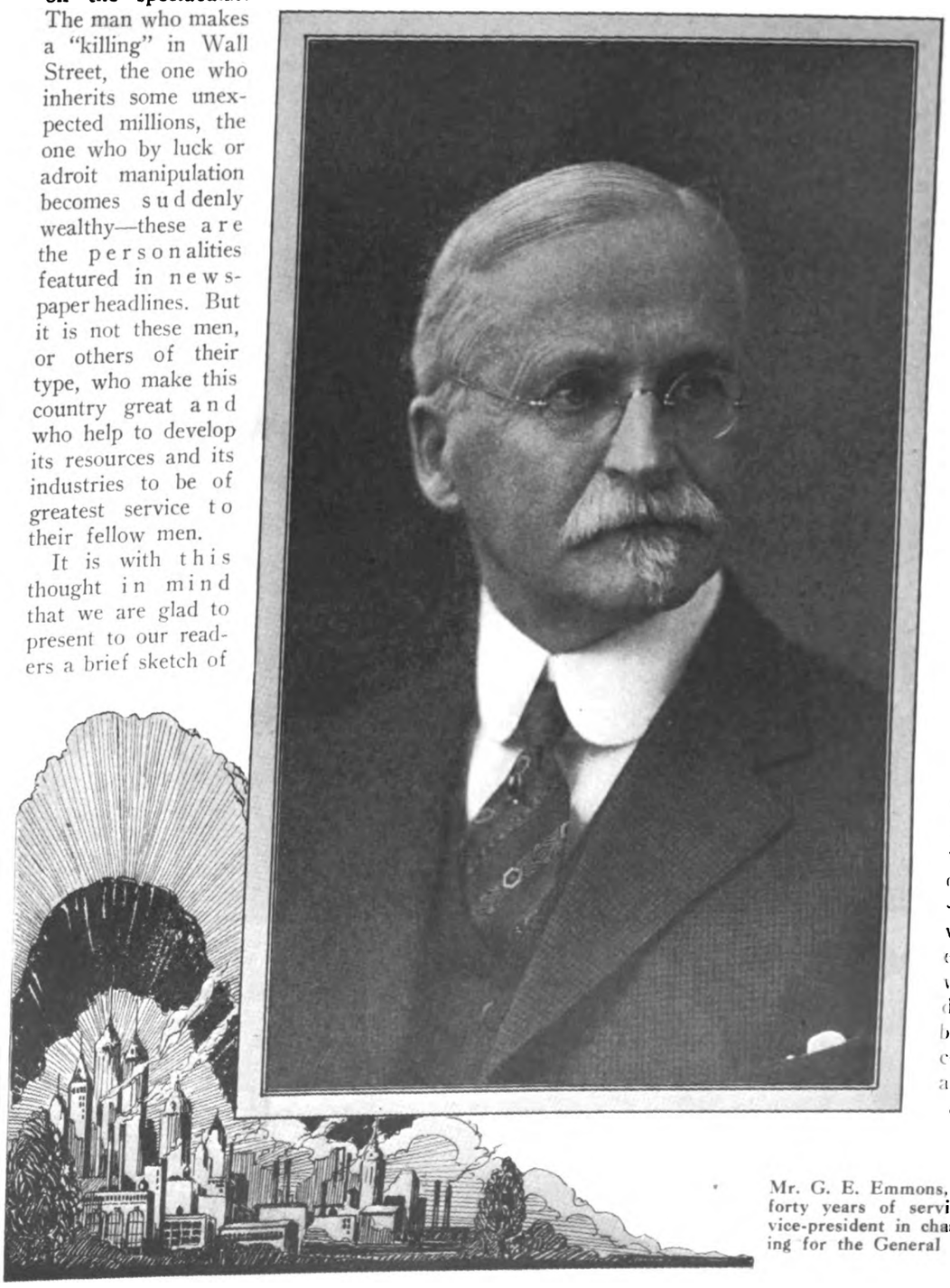
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Men Who Make American Industry

G. E. Emmons, Retiring Vice-President of the General Electric Company

IN the midst of what has been aptly called a "jazz age," we are prone to put an undue emphasis on the spectacular. The man who makes a "killing" in Wall Street, the one who inherits some unexpected millions, the one who by luck or adroit manipulation becomes suddenly wealthy—these are the personalities featured in newspaper headlines. But it is not these men, or others of their type, who make this country great and who help to develop its resources and its industries to be of greatest service to their fellow men.

It is with this thought in mind that we are glad to present to our readers a brief sketch of a career typically American, in the best sense of the word—the career of Mr. G. E. Emmons, who is retiring from the vice-presidency of the General Electric Company after nearly forty years of service.



Mr. G. E. Emmons, **who, after almost forty years of service, has retired as vice-president in charge of manufacturing for the General Electric Company.**

Only a few men now living have been as intimately connected with the electrical industry since its first humble beginning as Mr. Emmons. In the forty years of his connection with the Thomson - Houston Company and the General Electric Company he has seen the industry develop from a few small workshops manned by men whose courage all the manifold discouragements could not dim, to its present position as one of the basic industries of the country.

With Prof. Elihu Thomson and E. W. Rice, Jr., honorary chairmen of the Board, he worked in the little plant of the American Electric Company, at New Britain, Conn. It was a small building of only 40,000 square feet, and when they considered leasing the whole building they decided not to do so because they felt they could never occupy all the floor space.

(Cont'd on page 60)

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HERE'S to Young 1925!!

the Most Promising New Year that has Dawned in a Decade

—and here's our hand on't!

THE new twelvemonth is upon us. In a few days we will greet it with a roar of welcome. Never has a youngster come in more propitiously. All the signs point to a year of notable prosperity.

"We have definitely turned the corner," says Judge Gary.

"The pendulum again swings upward," says Col. Ayers, Vice President of the Cleveland Trust Co. and a national authority.

"1925 bids fair to be a year of real prosperity," predicts Richard F. Grant, President of the United States Chamber of Commerce.

"By next June, there won't be enough cars to supply the demand", Edw. S. Jordan of the Jordan Motor Car Co., told a big automotive convention recently.

We hope you, too, are re-aligning your business to the "area of prosperity" that is just ahead of us. We certainly are.

We here at SKYBRYTE, like the Zoroastrians of old, are "sun worshipers." We are great believers in Daylight, the Natural Illuminant.

Our mission is to bring daylight into dark factories. We make some profit for ourselves, we make more profit for the factories and best of all we are the means of bringing more comfort to the workers—preventing the eye-strain and accidents due to poor light.

1925, here's to you! May your shadow never grow less! We hope you will be as good to our customers as you are going to be to us.

The SKYBRYTE Company, 1100 Keith Bldg., Cleveland, Ohio
Chicago Branch: Tower Bldg., 6 North Michigan Ave.

REG. U. S. PAT. OFF.

Skybryte CLEANER (LIQUID)

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The Elwell-Parker Portable Electric Crane with Telescoping and Revolving Boom

THIS latest feature adds much to the flexibility by increasing the outreach range to 17 feet and the lift to 18 feet.

Operation

It reaches up over the stack, motor truck or locomotive or far out over a dock. With collapsed boom it will nose into a freight car to pick up a load. It is revolved by hand or motor to suit the work.

It will switch loads on conveyor systems, erect machinery, set up ship or vault plates, haul sheet steel from cars and stack in yard or warehouse.

Control

Operator is master of travel, slewing, hoisting or booming 3000 pound load by closing electric switch. A central battery provides power for all operations.

The self-contained unit may be driven anywhere on the premises where runway will support load.

Design is refined in every operative and safety detail, stamping it the thoroughbred of its type. Yet the rugged construction of high grade materials bespeaks its fitness for the difficult tasks it performs day after day.

Run over in your mind the handling of heavy materials in your factory or mill and picture it eliminating aisle and storage congestion, accidents and waste of time. Then request Bulletin 60.

The ELWELL-PARKER ELECTRIC COMPANY

Cleveland Ohio



Fighting Friction in the Power Plant

(*Continued from page* 31)

The carbon residue content, and
The demulsibility or ability to separate from water.

Of course, while these are all inherent to any fluid lubricant, according to its manner of refinement, they are, however, not all indicative of its adaptability for any particular type of power plant prime mover. In other words, where the viscosity might be the most important specification for one type of lubricant, the pour test, on the other hand, would be the salient factor for another, or perhaps the fixed oil content, for a third. Again, two or more might be equally important, as, for instance, in a steam cylinder oil, where viscosity, flash and fire points, and fixed oil content are all decidedly essential.

Reciprocating steam engines involve two classes of lubrication, i. e., internal or steam cylinder, and external. For such engines, therefore, two distinct types of lubricants are usually advisable. Steam cylinder oils, or those products designed for the lubrication of the internal wearing parts of the cylinders and valve chests, are perhaps the most intricately prepared of any of the more usual lubricants which will be met with. This is, of course, owing to the fact that their preparation requires conformation to the operating conditions involved, and these latter are extremely variable in general practice. For example, the usually accepted factors which will affect the selection of any steam cylinder lubricant include:

The steam pressure,
The moisture content of the steam,
The temperature of the steam,
The speed of the piston,
The extent to which washing action occurs,
The wiping effect of the piston on the oil film,
The type of valves installed,
The manner of injection of the lubricant into the engine,
The arrangement of the cylinders, etc.
Whether the engine is vertical or horizontal,
Whether tail-rods are installed,
The vaporizing effect of the heated surfaces on the oil film,
The extent to which boiler compounds are used.

Fig. 10. Plan view of a compressor installation showing clearly the necessary piping for circulation of lubricating oils and cooling water.

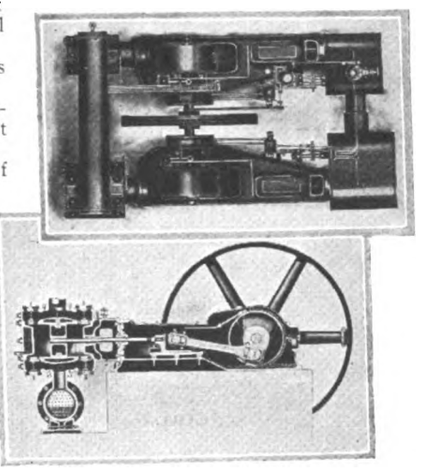


Fig. 11. Longitudinal section through a typical air compressor, bringing out clearly the manner of distribution of the oil to the so-called external parts.

As has been already stated, viscosity, flash and fire points, and fixed oil content, are the usual properties which are subject to consideration in the manufacture of a steam cylinder oil. By judicious preparation and selection of the stock, a final product

(*Continued on page* 40)

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Materials Handling FORUM.

Conducted by Matthew W. Potts



Question No. 30.

"Your use of the words *materials handling* has always bothered me somewhat.

"The word *material* carries in itself a plural connotation which seems to make it unnecessary to add the *s*.

"After all it is usage which determines how a word shall be spelled. Until you used the word materials in connection with material handling, the writer had never seen this usage. Since then he has talked with many others of greater experience and none remember ever having seen the words *materials handling* used.

"Another angle. Aren't you in your magazine appealing to practical men? All practical men are more or less suspicious of affectations of any sort which they take as an indication that the person writing is not a practical man."

* * *

You are correct (in the second paragraph). The word "material" implies the plural, but in Funk & Wagnalls' New Standard Dictionary there is a direct reference to *materials*—"specif.; the matter that forms or may form a component part of some material structure, as a machine or a building; often in the plural; as, the strength of materials."

In using the plural, we did not intend any affectation, for as you say, we are trying to be practical. Because of this desire, after much thought and deliberation, we agreed on the use of the plural. There has always been a distinction between our editorial reference to the subject and that of many other magazines, but it is surprising to note how many others are now following the lead which we took. You will have to admit that we are consistent, while others seem to have no definite policy, frequently using the singular and the plural in two different articles in the same issue. We do not claim priority on the use of the word "materials." We note that Mr. Harwood Frost, in an address before the Civic Industrial Division of the Chicago Association of Commerce on April 1, 1920, spoke on the subject of "Cost of Waste in Present-Day Methods of Handling Materials." At that time, Mr. Frost was the President of the Brown Portable Machinery Company. Even before this date, in the Mechanical Engineers Handbook, published by the McGraw-Hill Book Company in 1916, in Section 9, page 1105, C. Kemble Baldwin, M. E., Vice-President, The Robins Conveying Belt Company, made extensive use of the plural "materials."

We also find on page 149 of the Material Handling Cyclopedia, published by the Simmons-Boardman Publishing Company in 1921: "A treatise on the construction and operation of hoisting apparatus as used in modern industry for handling the products of forests, field and mine; for loading and unloading *materials*, for transportation, for handling *materials* in construction work; and for handling raw *materials* and moving the finished product in manufacturing plants" by Charles N. Winter, Managing Editor, Car Builders Cyclopedia, Locomotive Cyclopedia; Associate Editor, Railway Age; Associate, American Society of Mechanical Engineers. Also on page 407: "A treatise covering the construction and application of continuous elevators and conveyors for handling loose *materials*," by Henry J. Edsall, Engineering Department, Link-Belt Company.

This Forum provides a place for the discussion of materials handling problems of general interest.

Each question published will be answered on the basis of our experience and available information. Further discussion of these problems will be welcome, and we will publish such letters as, in our estimation, contribute to a clearer understanding.

Since "materials handling" has been put forward as the next and most important progressive step in industrial management, the American Society of Mechanical Engineers has found it necessary to form a separate division, which is now known as the *Materials Handling Division*; presided over by Mr. H. V. Coes. In the July, 1924, issue of Mechanical Engineering (the monthly journal published by the Society) an article under the title of "Fundamental Economies of *Materials Handling*" was written by Mr. M. L. Bogeman, Assistant Professor of Mechanical Engineering, University of Michigan. This article was contributed by the *Materials Handling Division* and presented at the Spring meeting, Cleveland, Ohio, May 26 to 29, 1924.

We also find in looking over old catalogs and circulars by various equipment manufacturers that "materials" (in the plural) is frequently used in describing the use to which their equipment can be put.

Not being satisfied with the above evidence as to the proper use of this term, we took the liberty of putting the question to Mr. George B. Hotchkiss, Chairman of the Board of Advertising and Marketing, New York University, who informs us that the word "materials" would be his preference in the sense which we use it and it is also rhetorically correct.

It will undoubtedly interest you to know that we are not entirely satisfied with this designating term "materials handling equipment" but in covering the subject as we have, with each article illustrating and describing various types of equipment for handling various materials, it has been necessary to make the term as broad as possible. We have often thought of using the term "mechanical handling," but this immediately eliminates hand trucks, hand lift trucks, or other hand power equipment, which are an essential part of the "subject of materials handling."

* * *

Second Letter.

"In reference to our discussion of "materials handling," "material" seems to be a collective noun, with an optional plural. The preference goes to the meaning in the specific sentence. When the class of matter grouped under the word varies as "working materials," the dictionaries use the "s." When the material is composed of like matter, as "the material in that dress," the evidence seems to point to a preference for a plural without the "s."

"Webster's New International Dictionary:

"'Material (ma-te'ri-al) n. 1. The substance or substances, or the parts, goods, stock or the like, of which anything is composed, or may be made, or which is necessary to the doing of something; as, dress *material;* writing materials. (2) substances or specimens for study, as museum *material;* herbarium *material.* (3) data of any sort, such as notes, documents, sketches, etc., which may be worked up in a more finished form; as *materials* for a biography.'"

"Murray's Oxford Dictionary:

"'The matter from which an article, fabric or structure is made. *Chiefly collective, pl. or sing.*—Raw material (s manufactured material)—Tools for performing an action.—Now used *only in writing materials.*'

"Illustrations from old books show the added 's' to be the older form."

"Century Dictionary:

"'That with which any corporeal thing may be made or done, as the *materials* of the soil or of disintegrated rocks; wool is the material of the cloth; building or writing materials; war material:—that which composes a part of anything, as the materials of one's thoughts; the materials of a drama.'"

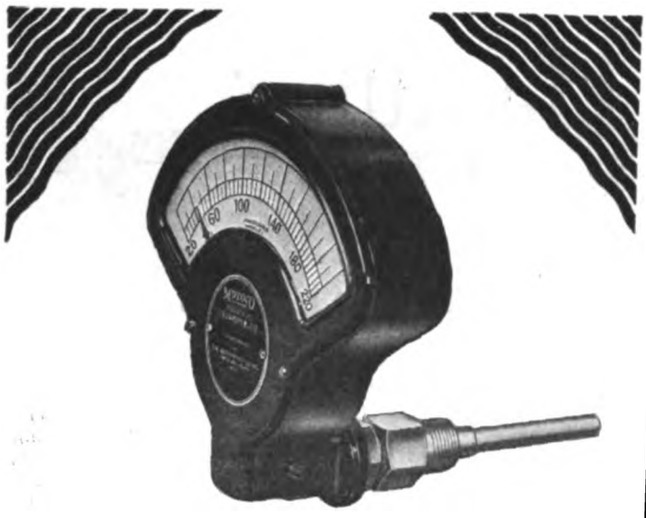
"Funk and Wagnalls' New Standard Dictionary:

"'That of which anything is composed or may be constructed or its analog—considered as a component part of something. — specifically, the matter that forms or may form a component part of some material structure, such as a machine or building; often in the plural as strength of materials.—Specimen for investigation, as anatomical material.'

"From the above I should say that there is still some excuse for saying 'material handling' instead of 'materials handling.'"

(*Continued on page* 100)

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Putting the Westinghouse OK on the

MOTOCO

INDUSTRIAL THERMOMETER

When any instrument receives the O. K. of Westinghouse Electric & Mfg. Co.'s engineers, you can depend upon it that that product *will make good for you!*

Last year the Westinghouse Company put the Motoco Thermometer to the "acid test," with the result that we received their order for 12,000 instruments, followed by a letter reading in part as follows:

"There are many thousands of these indicators in use at the present time and they are giving entire satisfaction."

Big firms like Westinghouse, who have at their command some of the most able engineers in the country, *know* what they're doing *before* they make a move. And when they say that thousands of Motoco Thermometers are giving entire satisfaction, isn't it a pretty safe guide for *you* to follow?

The Motoco Dial Thermometer (and that means easy-to-read thermometer) sells at the price of a high-grade glass tube thermometer.

Furnished with capillary tubing or with straight or angle stem, for temperatures between minus 40° and plus 750° F.

Write for our handsome new Catalog No. 10

The MOTO METER CO., Inc.

Industrial Thermometer Division

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(*Continued from page* 38)

can be produced by capable refiners, which will adequately meet the above variables, or such of their combinations as are usually found. For example, oils of low viscosities are adaptable to lower pressure steam conditions. Therefore, as higher steam pressures are encountered a correspondingly higher viscosity oil should be used. The ultimate object is, of course, to select a product which will be as perfectly atomized and distributed by the steam as possible. It must be remembered that the steam serves both as the atomizing and carrying agent for the finely divided oil, therefore, the nature of the latter must be such that it will lend itself readily to the character of the latter.

The atomizing ability of an oil is influenced by the fixed oil content or the extent to which it is compounded. In general it is considered that addition of fixed oil compounds (animal oils) to a mineral cylinder stock will increase its atomization, all other things being equal. As a result, inasmuch as compounding is necessary in any oil for use under saturated or low pressure steam conditions, the combined effect of the fixed oil and the customarily lower viscosity of the stock, normally will lead towards relatively complete atomization, provided the oil is properly introduced into the steam line, sufficiently above the throttle valve to give the steam time to act upon it, via the atomizer. As higher steam temperatures and pressures are met with, however, the moisture content will become proportionately lower. Therefore, the fixed oil content can be reduced, and an effort made to use an oil of lower volatility, otherwise, abnormal vaporizing might occur when the oil comes in contact with the more highly heated cylinder and valve chest surfaces, etc. Furthermore, viscosity decreases with increase in temperatures. As a consequence a stock of higher original viscosity should have been used by the refiner in making a cylinder oil for such conditions, otherwise, in event of low piston ring clearances, the thick-

Fig. 12. Where engine and dynamo lubrication is involved force feed lubrication is certainly a safeguard. Note the automatic force feed lubricator to the left of the engine.

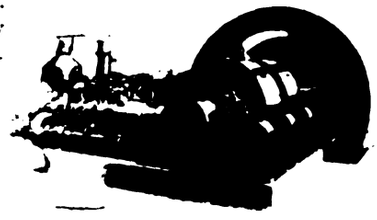
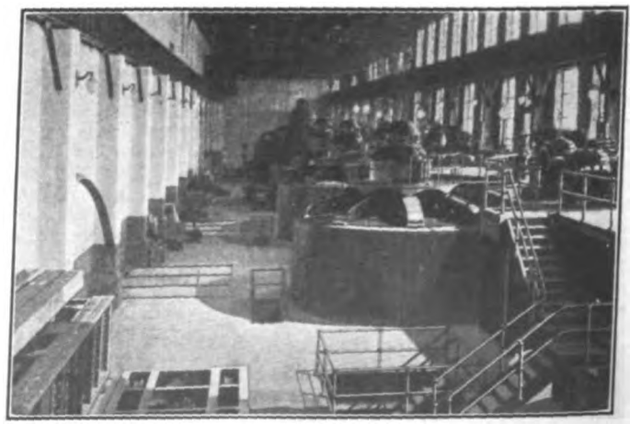
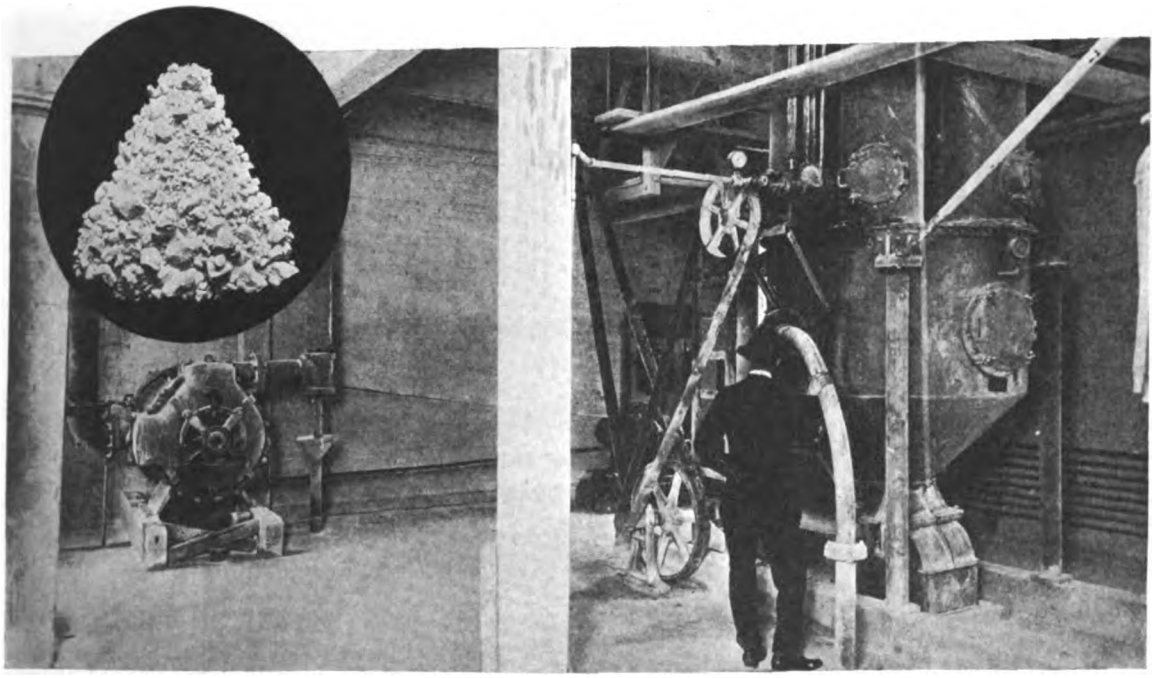


Fig. 13. With correct lubricants, properly supplied to the various surfaces, even the largest installations involve no difficulty.



(*Continued on page* 43)

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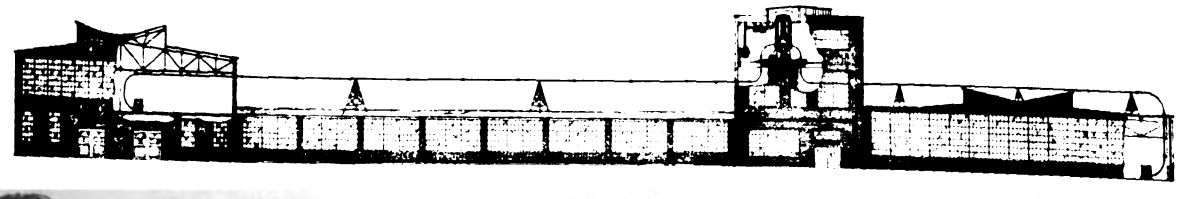
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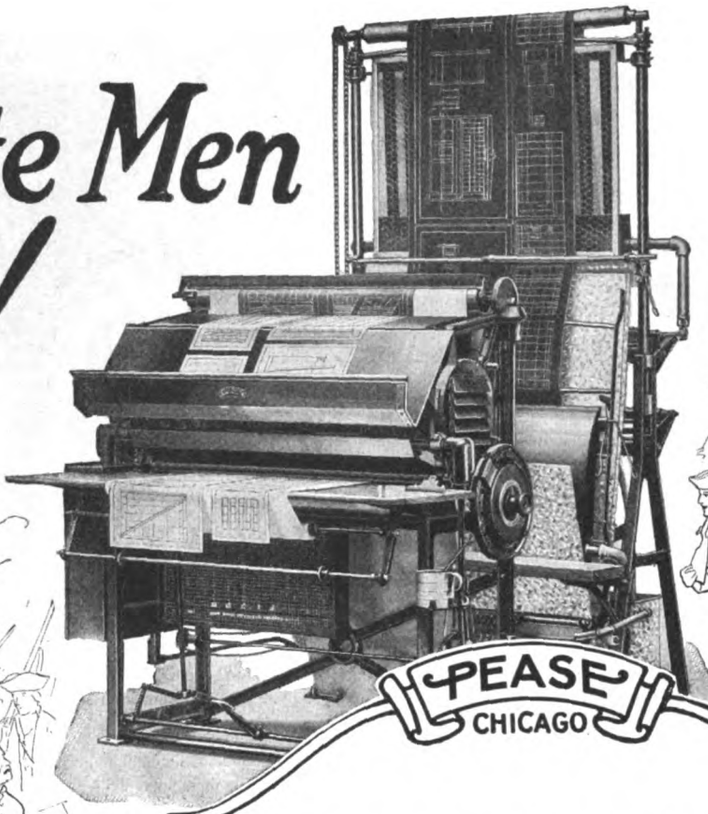
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(*Continued from page* 40)

ness of the oil film may be so low as to lend itself readily to "wiping" by the rings in the course of operation.

In other words, it can be appreciated that the physical condition of the steam will normally affect the atomization of the cylinder oil. To ascertain the manner in which such oils should be prepared, refined and compounded to meet these conditions has required intensive experimentation and research. Ultimately the proof of the lubricating ability of such an oil is the extent to which the wearing surfaces are kept in proper condition, wear precluded, and lubricating costs maintained within the proper limits. Your oil marketer should be able to advise as to the extent to which his several grades of steam cylinder oils are refined to meet your operating and steam conditions as brought out above.

External engine lubrication, in contrast to internal or steam cylinder lubrication, involves parts whereupon the effects of the lubricants can normally be directly noted without much trouble. These parts include the main

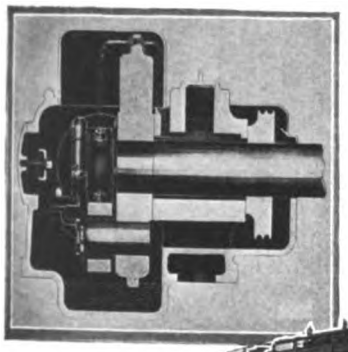


Fig. 14. Unless the oil has access to every part of such a bearing, effective lubrication will be relatively impossible of attainment.

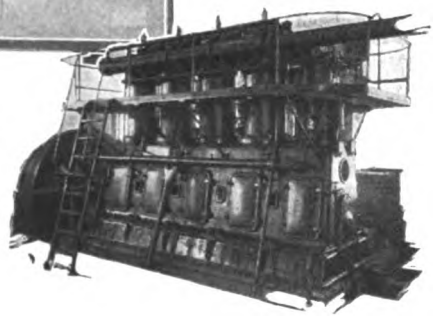
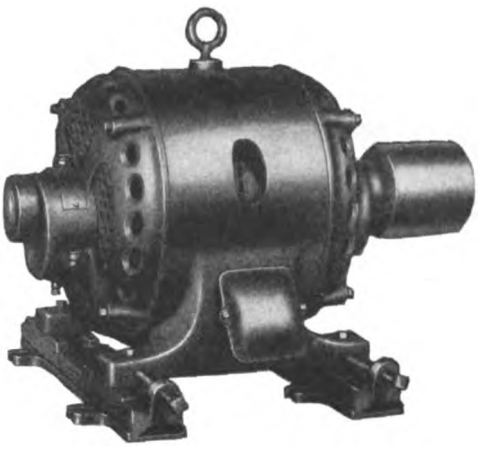


Fig. 15. The relative compactness of the oil engine coupled with its economy renders it an ideal piece of power plant equipment.

bearings, guides, pins, crossheads and valve mechanisms, etc. For their lubrication, what are commonly known as engine oils, are usually adaptable. In the selection of such lubricants the viscosity is the outstanding specification or characteristic. In other words, an oil should be chosen which is of sufficient body or viscosity to adequately prevent metal-to-metal contact of the wearing parts. In choosing an oil for this purpose, consideration should be given to the speeds of operation of the several parts, the size of the bearings, the pressures involved, the operating temperatures which are prevalent and the probable quantity of oil necessary to adequately bring about effective and continuous lubrication. Where water conditions may be prevalent, or there is possibility of the oil being contaminated with water during circulation, as may occur in some types of enclosed crank-case engines, it is also important to look into the demulsibility of the oil, or its ability to readily separate from water.

Now the rate at which any oil will separate from water will depend to a large extent upon its viscosity and the care which has been observed in its refinement. In other words, a closely fractionated, carefully filtered, straight run mineral distillate of approximately 200 seconds Say-



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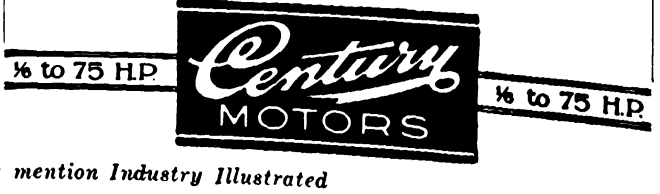
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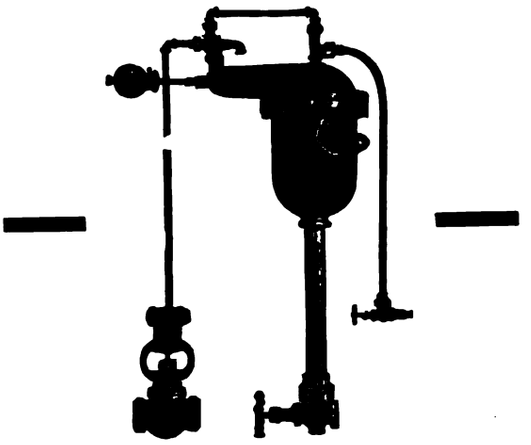
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bolt viscosity at 100 degrees Fahrenheit, would normally show a far better demulsibility than a non-filtered blend of higher viscosity. So it is evident that these two essential specifications must be considered together.

The nature and design of the oiling or lubricating system must also be given attention, especially from the viewpoint of the viscosity of the oil. In other words, hand or cup-oiled bearings which may be incapable of being flushed out with oil must naturally retain their oil over a longer period of time than would be necessary in a splash or circulating system. Otherwise a certain amount of direct waste might result. Therefore, somewhat heavier oils should be selected for bearings of this type. Here, also, there would be the least necessity for the oil to show good demulsibility, therefore a considerably higher viscosity could be used than other lubricating systems would permit.

An oil for turbine service in turn should be chosen with chief regard for its viscosity and demulsibility characteristics. On the other hand, the fact must never be overlooked that it should always be a pure, highly refined,

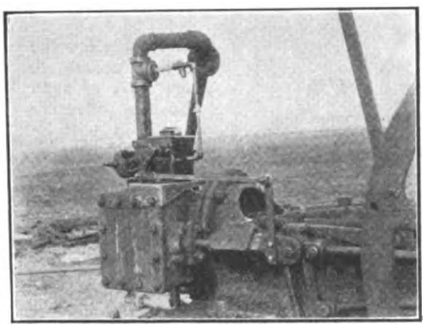


Fig. 16. Another application of a mechanical force feed lubricator to the cylinder of an oil field engine.

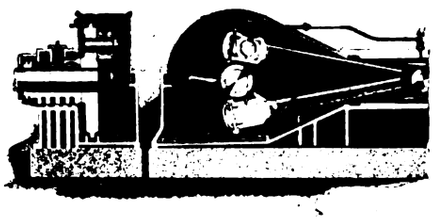
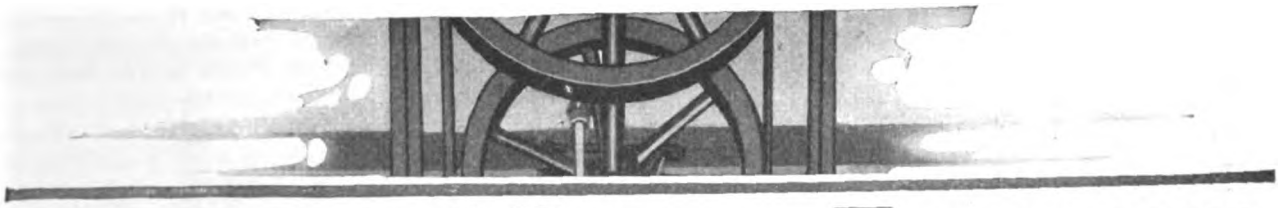


Fig. 17. Main bearing and crank pin lubrication are among the most important of the externally lubricated parts found on the average reciprocating engine.

filtered product, free from acidic reaction or fixed oils, with a low affinity for water. Such oils are subject to high speeds, the possibility of steam leaks bringing about the presence of water in the lubricating system, the chance of considerable heat reaching the bearings due to both conduction and radiation and oftentimes lack of suitable or adequate means for oil purification. Water, especially, is a decided element of objection which requires consideration on account of its effect upon the useful life of such an oil. As a result, the greatest of care should be observed to prevent it from gaining entry in excess into the storage tank, purifier or oiling system. Otherwise, if not removed, it will be churned up with the oil to develop emulsions. Now, while emulsions are relatively easily formed, even in the best of oils, they will not be detrimental unless they are allowed to accumulate foreign matter such as dust, dirt, metallic particles and carbon to form sludge. It has been proven that the higher the quality of the original oil, the more readily will such emulsions separate out, and the less possibility will there be for them to retain foreign matter to such an extent as to develop serious sludging.

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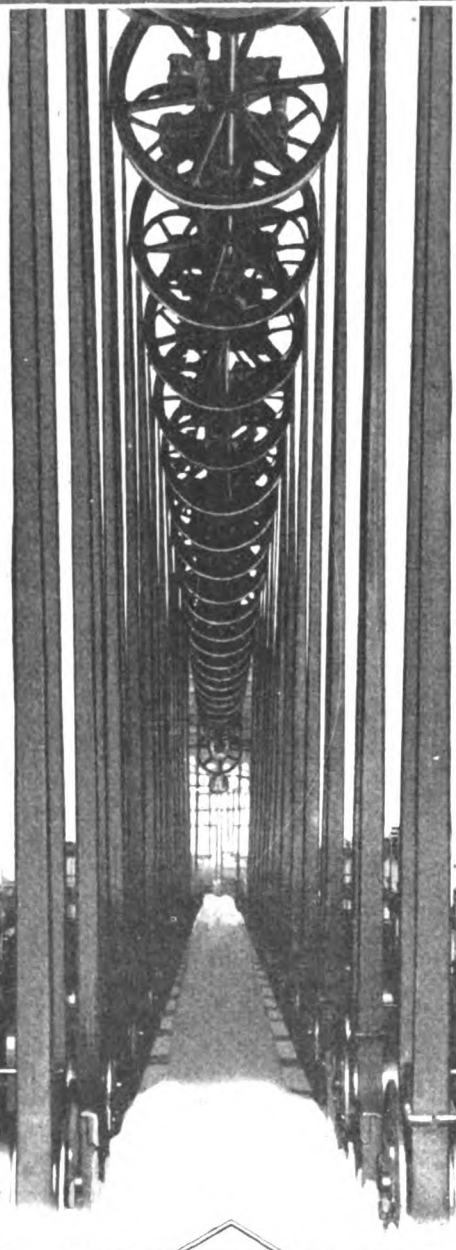
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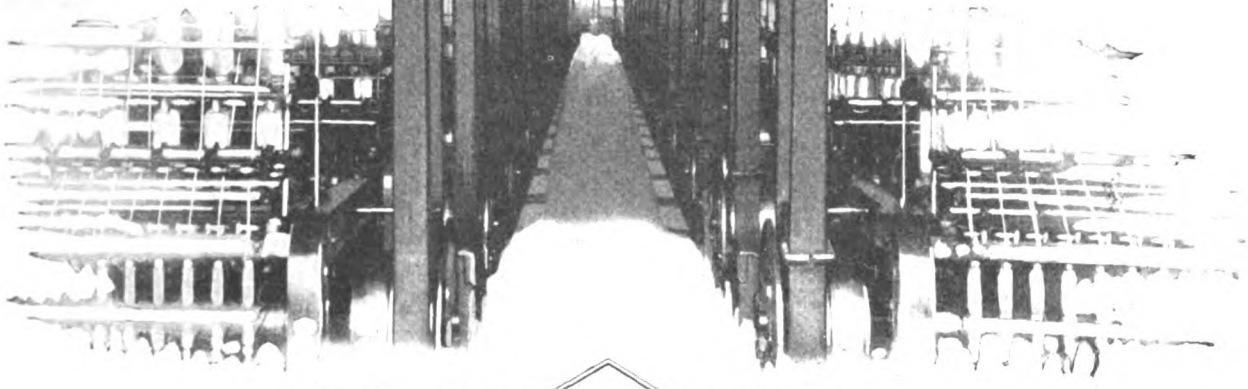
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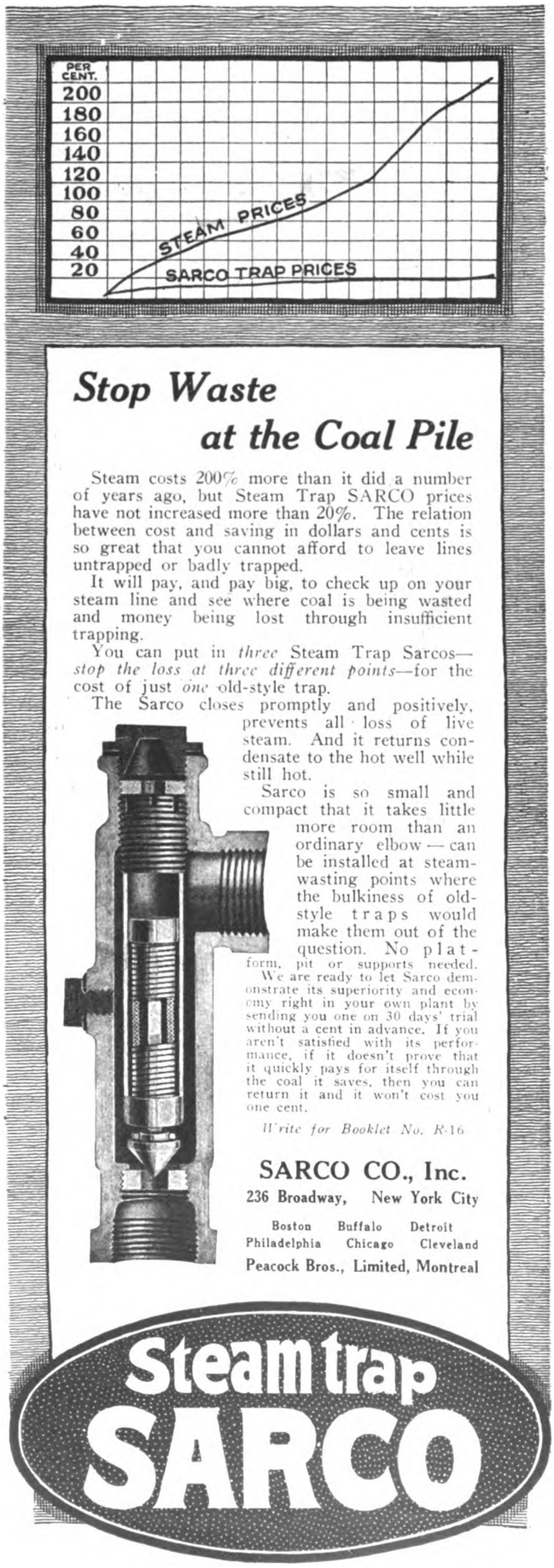
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(*Continued from page 44*)

In addition to the above, there are also certain operating conditions which should always be considered, such as the clearance space available, the speed of rotation and the size of the bearings. In fact, they have such a direct bearing upon the extent to which a satisfactory oil film can be maintained in accordance with the viscosity, that it can safely be stated that this latter should be contingent upon them as a general rule. The larger the clearance space, for example, and the more accurately the bearings are chamfered at the point of entry of the oil, the more easily will the revolving shaft be able to draw the requisite amount of oil into service; pressure lubrication, of course, aids to a very considerable extent. Chamfering enables the oil film to assume the shape of a wedge, the point of entry being at the base or the widest point.

Bearing sizes and operating speeds in turn involve the pressure which will be exerted upon the oil and the rate at which it will be drawn through the bearing. Of course, a film of oil will always be present on the surfaces of the

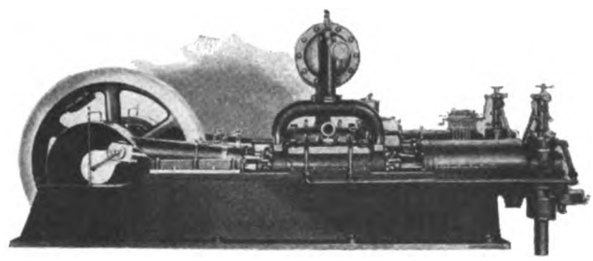


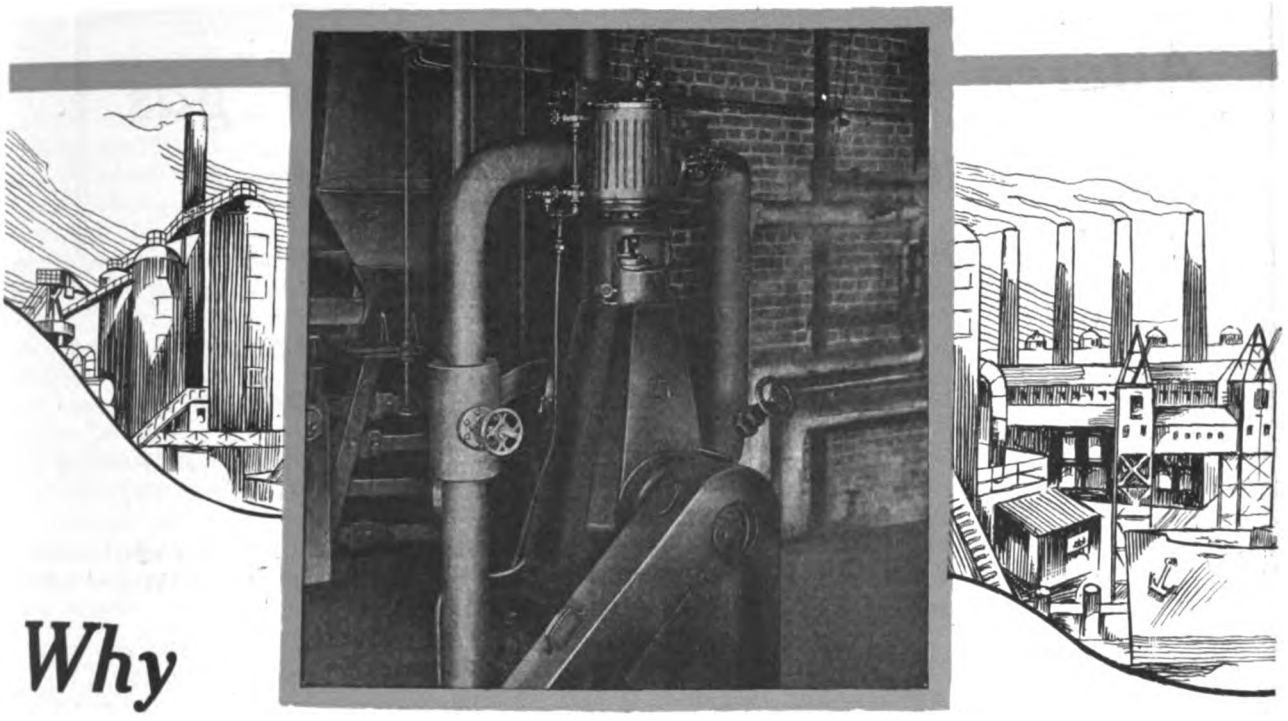
Fig. 18. The application of a mechanical force feed lubricator to a horizontal engine. Note lubricator at right of picture.

bearings and shafts; the thickness of this film will, however, be a decided variable, for it will be dependent upon the viscosity of the oil, the internal cohesion which exists between the component particles, and the adhesion which occurs when the oil comes in contact with the metallic surfaces to be lubricated. But pressure, due to the weight of the bearing, tends to preclude the formation of such a film. Fortunately, however, the force of attraction which is set up during rotation of the shaft outweighs the more or less constant resistance of pressure, thereby is lubrication maintained.

A turbine oil must also serve to carry away heat from the bearings. Naturally, if the heat developed during operation is allowed to accumulate, the viscosity of the oil will be proportionately reduced, until, perhaps, the latter will be unable to keep the metallic surfaces apart. Oil removes heat best if it is of the proper viscosity to develop as little internal friction as possible between its own particles, and if it is supplied to the bearing in a sufficient quantity, hence the adoption of the force feed, flood lubrication, wherein but a relatively small part of the oil actually lubricates. In this connection, however, the evaporative tendency is decidedly important. Evaporation, or the loss of certain of the lighter, hydro-carbon, components, naturally tends to increase the viscosity of the oil; in consequence, internal friction can be expected to increase. In oil under rapid circulation, when heated and in the presence of air, evaporation will usually be greatest. However, petroleum refiners have forestalled this to a certain extent by so carefully refining

(*Continued on page 49*)

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(*Continued from page 46*)

and fractionating their turbine oils that they will usually contain but very small percentages of lighter fractions.

Hydro-electric or vertical water turbines involve two essential parts requiring lubrication, i. e., the thrust bearings which carry the load of the rotating parts, etc., and the guide bearings which keep the units in proper alignment. The thrust bearings are commonly regarded as the salient features of such machines, due to the part they play in bringing about efficient operation. Just so, therefore, is thrust bearing lubrication of equal importance, for, unless adequately carried out, trouble will be bound to occur. Thrust bearings are generally oil pressure lubricated. Where guide bearings are babbitted they are likewise similarly oiled. Certain guide bearings, however, are capable of being equipped with lignum vitae instead of bearing metal, in which event water can be made to serve as the lubricant.

In general, the lubrication of the hydraulic turbine is subject to much the same requirements as that of the steam turbine. In other words, the oil must be of a relatively low viscosity or body, filtered and otherwise purified to render it capable of ready separation from water. Furthermore, such oil in service must be kept in the proper state of purity, otherwise it will quickly develop emulsification and sludging, especially if contaminated with water. Naturally a greater pressure is imposed upon the lubricating film in such a machine than in a steam turbine, for not only the weight of the rotating parts, but also the downward thrust due to water pressure must be carried. To meet this, the oil viscosity plus the pressure on the lubricating system must be relied upon. The former cannot be extensively raised, as might be done on an average plain bearing, for thereby would separation from water be rendered more difficult. Therefore, the oil pressure is increased to such an extent as to insure the maintenance of the requisite film. Using a properly refined turbine oil of from 180 to 200 seconds Saybolt viscosity, at 100 degrees Fahrenheit, a pressure of approximately 200 pounds on the system has been found to give perfect lubricating results on an average.

The oil engine in its turn involves an additional problem, for not only must the oils lubricate, but in general this must be effected under adverse operating conditions, involving considerable heat. For example, cylinder lubrication involves the matter of piston seal quite as much as it does lubrication, both being brought about under higher operating temperatures. Here the viscosity of the oil must be considered. In other words, the oil must have sufficient body or viscosity to maintain a suitable seal at the working temperature, yet it must be light enough at this temperature to insure the even spreading by the piston of a new film of oil to replace that which has been burned during each previous combustion stroke. If this is not brought about, serious compression losses may result.

In determining upon the correct viscosity that a lubricant for such service should possess, the weight of the moving parts, the fit of the piston rings and the method of application of the oil must be considered. In general the heavier the parts and the looser the rings, the more viscous or resistant to flow should be the oil. Also, where the oil is applied by some form of pressure system a heavier product can be used than in a splash lubricated engine, for in the latter case the oil must be more fluid in order to spread readily. The average power plant

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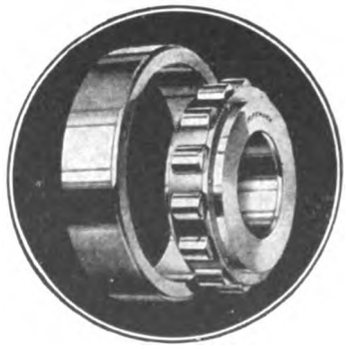
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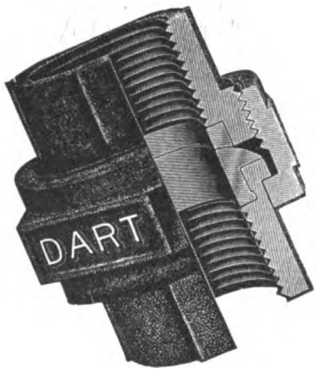
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Fig. 715, Bronze Fire Line Angle Valve.

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manager will prefer to use the same oil for lubrication throughout the engine, wherever possible, to reduce the number of products stocked. Therefore, such a lubricant should be capable of not only serving the cylinders and bearings, but also the air compressor.

Here, too, another property must be considered, i. e., the volatility of the oil, for it materially effects the decomposition. Inasmuch as decomposition is of course not to be desired, such oils are generally filtered through some medium which will remove the bulk of the carbonaceous matter contained, as it has been proven that they decompose less readily. Volatility, on the other hand, cannot be accurately measured or checked up by the purchaser; he must, therefore, depend upon the flash point as a relative guide in comparing any two oils. The flash point, however, is indicative only of the temperature at which active volatilization will take place; it is not a measure of the rate at which this will probably occur in actual operation. Yet, volatility is of decided interest, for it not only would indicate the approximate amount of oil that a suitably continuous lubricating film would involve, but also the extent to which such a film would remain effective on the cylinder walls. On the other hand, it must be borne in mind that but a relatively small amount of oil will be necessary to form such a film, unless piston ring clearance is abnormal or the cylinders are worn. For this reason, such oil must be fed in carefully regulated quantities, to avoid decomposition, votalization, and the development of carbon deposits.

In this connection, therefore, the carbon residue test of an oil to be used for oil engine lubrication is of interest; naturally, the higher the percentage of carbon indicated by such a test, the greater might such accumulations develop in actual operation. So an oil should be selected which will burn to as low a percentage of fluffy carbon as possible. Carbon of this nature, which is the usual residue from asphaltic base oils, is far easier to remove than the hard flinty deposits which result from paraffine base products. Furthermore, fluffy carbon will

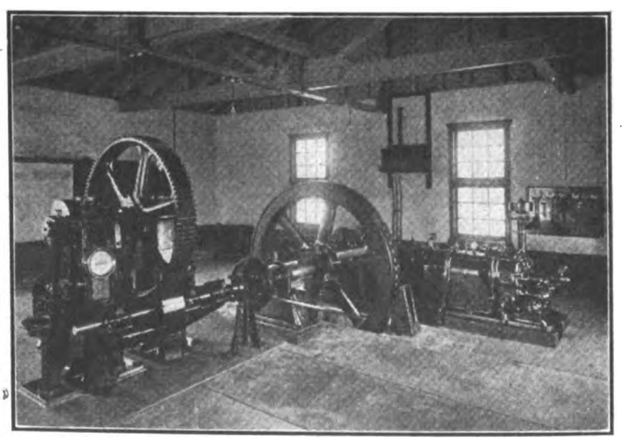


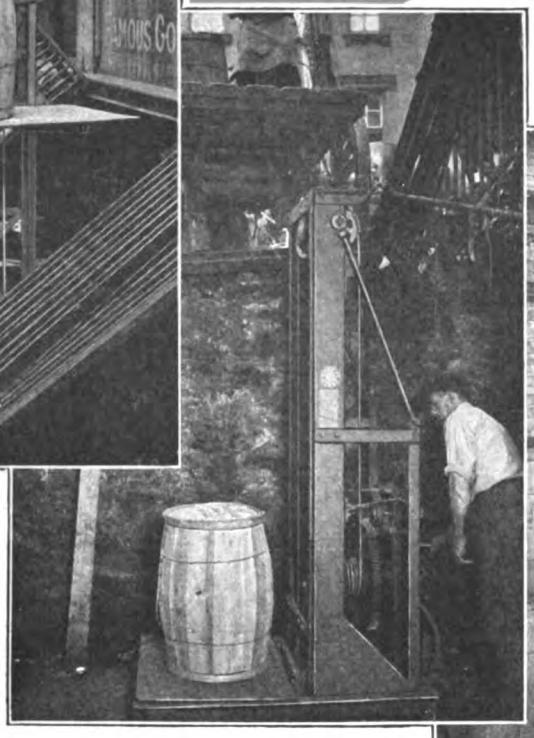
Fig. 19. Driving of such equipment as gear-driven pumps, etc., involves additional lubricating problems. Here we have gears, bearings and cylinders to take care of.

naturally be less extensive in the average engine, due to the fact that a good deal of it will be so light as to be readily carried out by the exhaust, or in the process of scavenging. An interesting fact is that the lighter the oil, or the lower its viscosity, the more rapidly will it burn, especially where lower flash points are involved. Consequently less carbon will be formed as a rule.

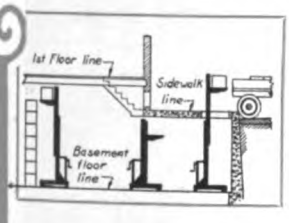
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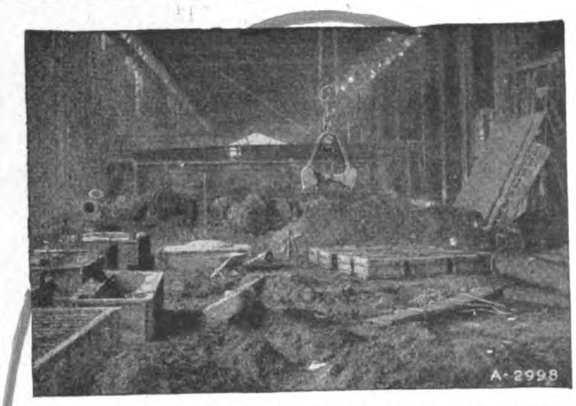
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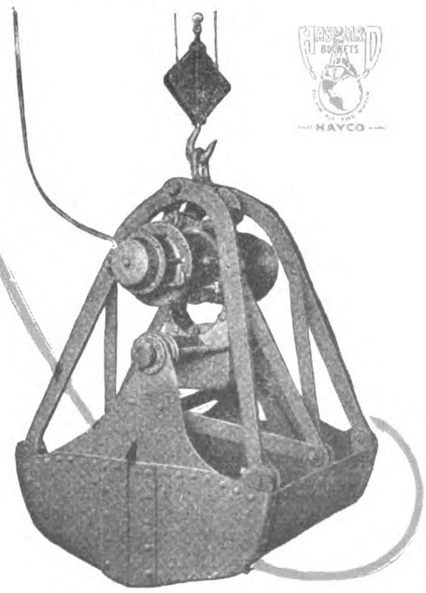
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3015-Y

The Potter Adopts Modern Methods

(*Continued from page* 21)

strike of a few years ago hit the industry, they were able to take common labor and, because of the well designed layout of mechanical equipment, train these men to their new methods. In doing so it was possible for them to

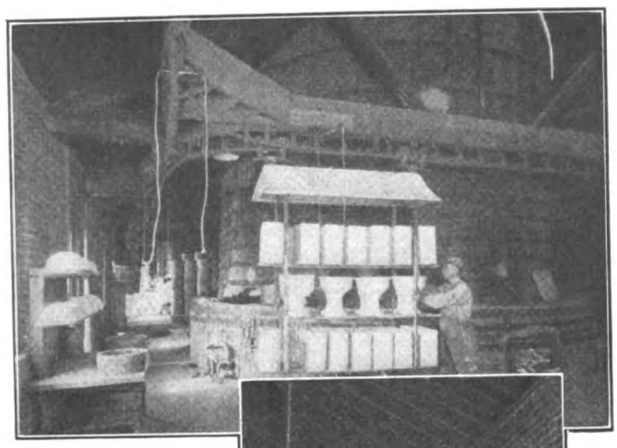




Fig. 10. This shows the modern method of handling unfired ware. The same method is employed when unloading a kiln.

Fig. 11. Up until recent years, potteries employed the same old conventional methods as used by the ancient Egyptians, namely one piece at a time on a man's head. These methods were employed on every handling operation throughout the plant.

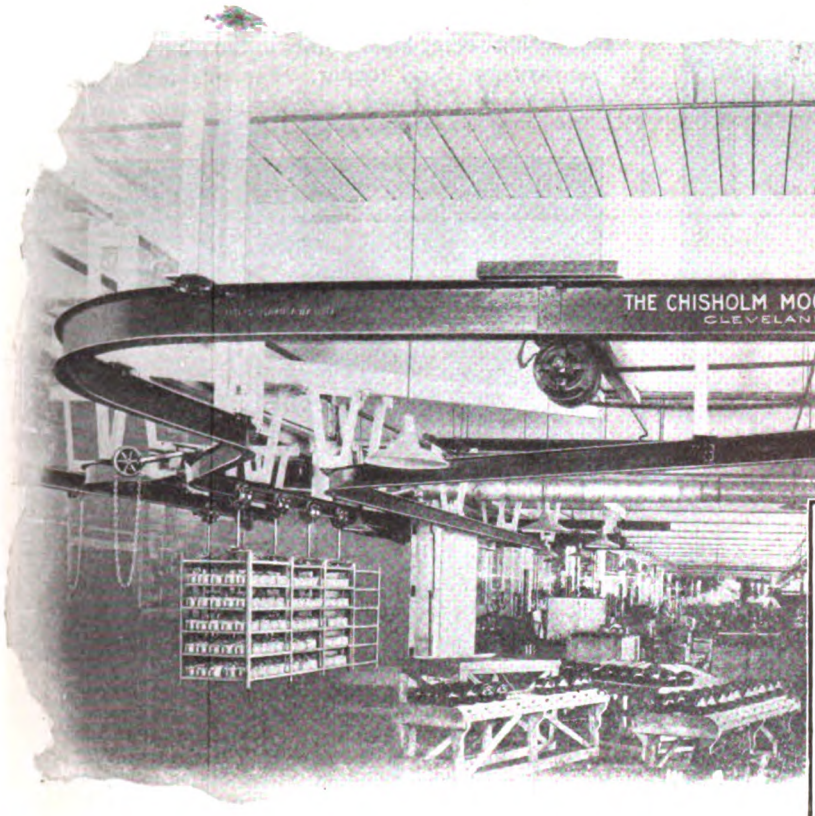
revise their wage rate so as to redeem some of the initial investment made for the equipment.

Most of the materials used in this plant are received from abroad and have been handled several times before being placed in the storage bins. It is, therefore, imperative to reduce the handling as much as possible. With uneven floor levels, the use of wheelbarrows and trucks was always difficult. By using the dump carrier, shown in Fig. 2, it is only necessary to load the material, weigh it, and then push it direct to the mixing vat, where it is worked into either plastic clay or slip. If made into plastic clay, the materials are put through a press and prepared in long cylindrical pieces, as shown in Fig. 3. If kept at the right temperature, and with the proper amount of moisture, these pieces can be stored for one or two days without deterioration. For this reason they are loaded direct to carriers, as shown, and stored in separate rooms, which are equipped with overhead carrier track, so as to eliminate handling. When the plastic clay is required for molding, one man pushes the car to the department where the clay will be used. In using "slip," the handling is all done by means of pipes and pumps, as this clay is liquid and flows freely.

For many years the mixture of clay, used in potteries,

(*Continued on page* 54)

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"C-M" Equipment Saves This Plant Over 33 1/3%

THE WESTINGHOUSE ELECTRIC & MFG. COMPANY, Springfield, Mass., installed Chisholm-Moore Overhead Material-Handling Equipment with two chief objects in mind—to reduce material-handling costs and speed up production.

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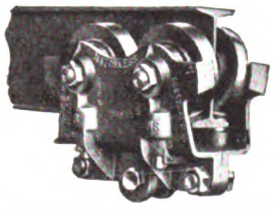
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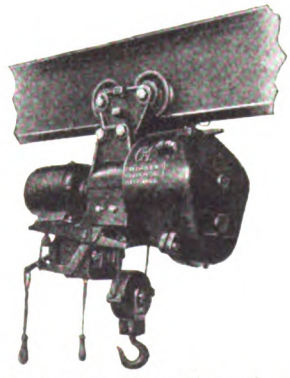
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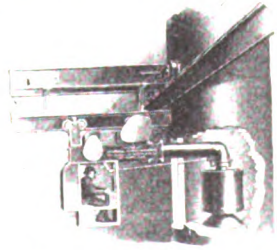
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(*Continued from page* 52)

has been a secret known only to the plant superintendent, the manager, and owner. For this reason, locked or secret scales are used for weighing each separate ingredient. Such a scale is shown in Fig. 2. This scale consists of a number of beams, each properly set, and arranged to actuate a common balance rod. Thus the workman weighs each material by number of the knob on the scale front.

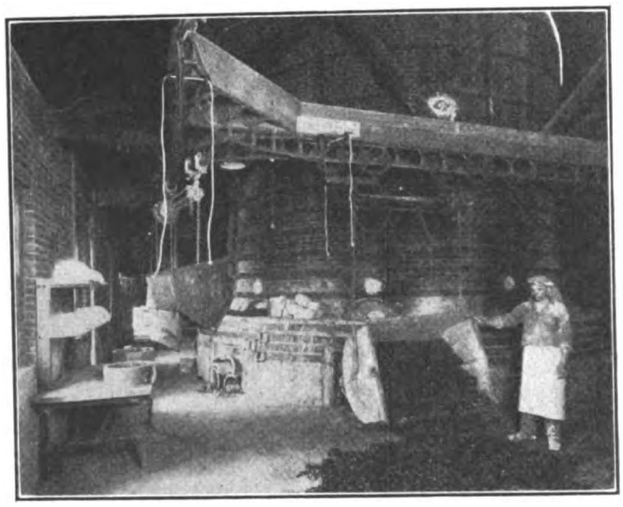
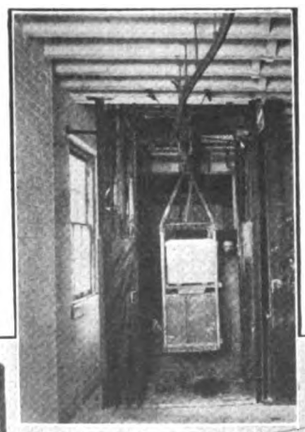


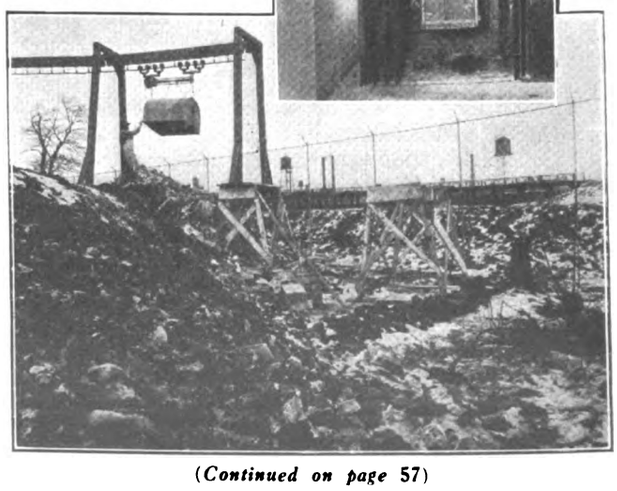
Fig. 12. Coal handling in a pottery is considerable in volume but only a small amount is used at each fire. It therefore presents a problem in distribution. This shows how the same overhead system can be employed for handling coal and illustrates the standard side dump bucket, while to the left is a special bottom dump bucket.

Fig. 13. Note details of the tracks suspended in the elevator, also special track opener, fitted on collapsible door, at the upper left hand corner of the elevator.

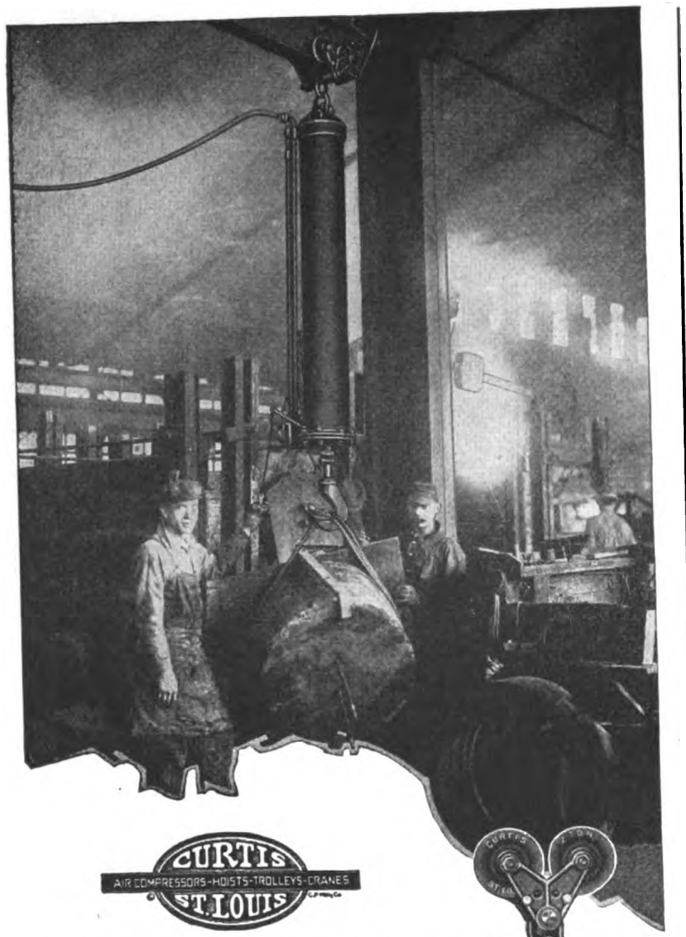


It does not matter whether the ware is fashioned from plastic

Fig. 14. This photograph was taken two years before Fig. 1 and shows how the B. O. T. Mfg. Company filled in the land about their plant. When taking Fig. 1 the photographer stood well over in the fence corner to the right.



(*Continued on page* 57)



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AIR COMPRESSORS-HOISTS-TROLLEYS-CRANES
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Economical—Safe—Speedy

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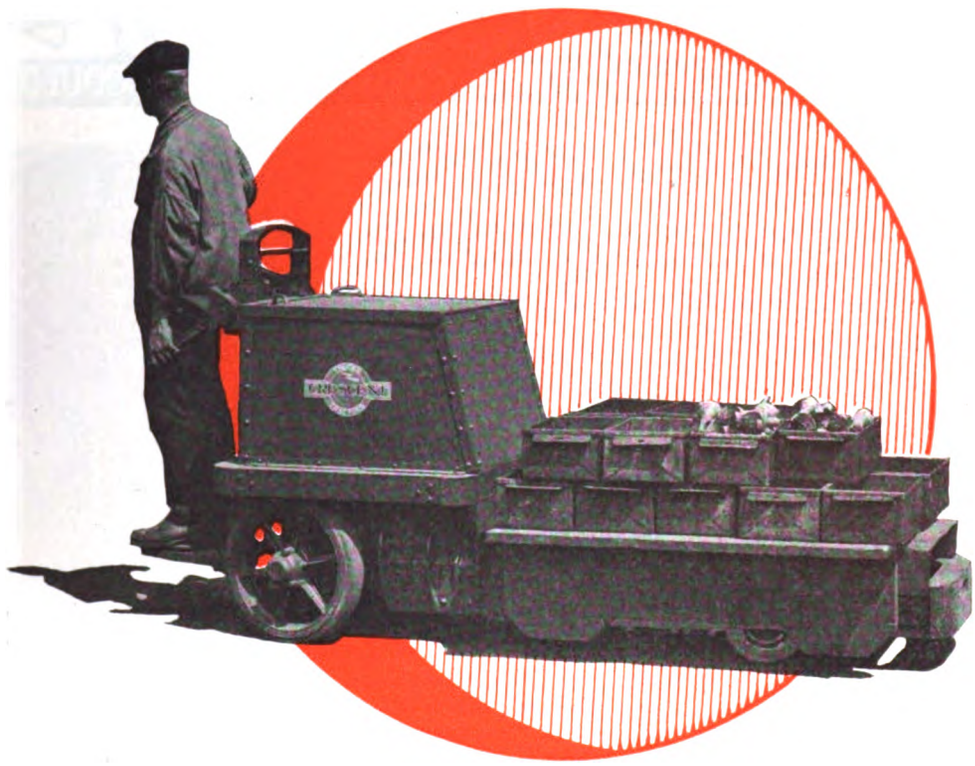


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that we have installed in the past 20 years"

So says the Hart Mirror Plate Co., Grand Rapids, Mich., of its Louden Overhead Carrying Equipment.

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OVERHEAD CARRYING EQUIPMENT

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Every carrying job up to 2000 lbs. in practically any business can be handled with greater dispatch and economy by Louden Overhead Carrying Equipment. Moderate in cost. Installed by local labor.

The opportunity to show what a Louden System would do for you is all we desire. You will commit yourself to ***nothing*** by calling in one of our engineers in your vicinity to make a survey and report on the material handling savings that can be effected within your own particular plant. Just drop us a line.

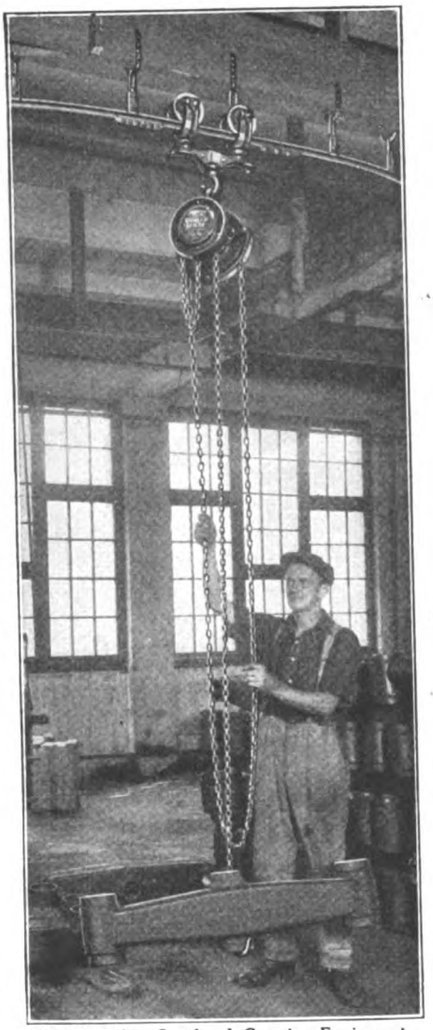
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It pictures many installations in various industries—from a few feet of track to many miles. Tells an interesting story of how other concerns have cut production costs. Send for your copy today.

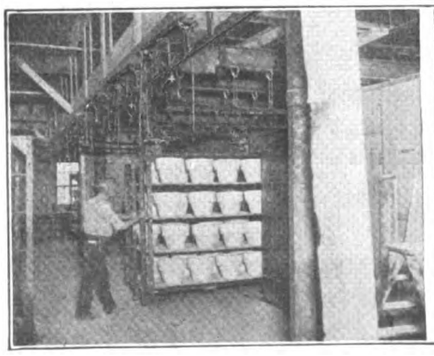
The Louden Machinery Company

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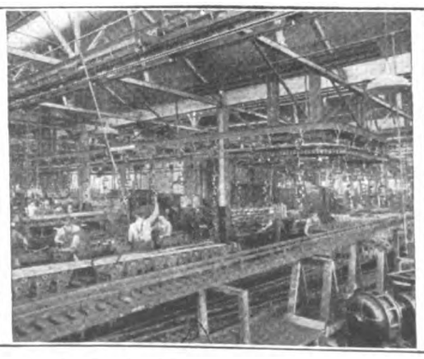
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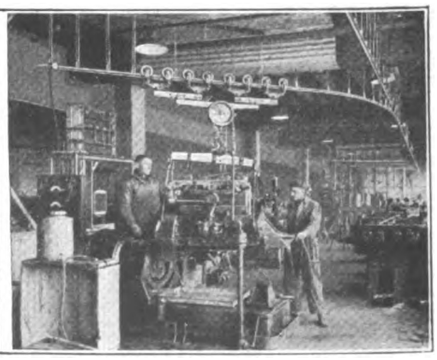
With Louden Overhead Carrying Equipment one man can lift and convey materials of any kind or shape, and up to 2000 lbs. in weight, from machine to machine, floor to floor or building to building. Because of its extreme simplicity the System can be readily extended to other parts of the plant at any time or, if necessary, taken down and changed about to meet reorganized production plans.



A ton of insulators in molds, quickly and smoothly conveyed to and through drying ovens by Louden Overhead. No loss as when jolted over rough floors. Westinghouse High Voltage Insulator Co., Derry, Pa.



Louden Overhead Carrying Equipment can be operated either by hand or power. Photograph shows it in continuous operation carrying crank shafts in one of the largest automotive plants in the country.



Setting 1700-lb. motor on test block, quickly, easily, safely. Overhead track routed over machines and heavy parts spotted on them. Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin.

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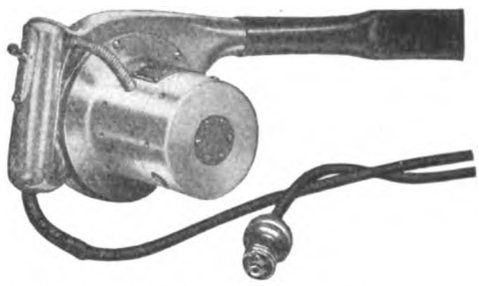
clay or cast in plaster of Paris molds, it must be given practically the same treatment. Fig. 5 shows one of the molding rooms and the number of the molds, also the method of transporting the green ware to the drying room. The arrangement of the drying room is shown in Fig. 6. By a system of switches and cross-overs, it is possible to run the loaded carriers into any aisle between the shelving. Here the ware is kept until it is properly dried, then it is reloaded to the carriers, lowered two floors by means of a freight elevator, which is shown in Fig. 13, where it is placed in the kiln for the first fire. After being fired, the same products are placed on carriers and transported to the second floor, where they are inspected for warps, blemishes, cracks and other defects. They are then sanded and the perfect ones are placed on placques so that they can be handled over gravity conveyors to the dipping process, where the glaze finish is put on. Fig. 7 shows a man dipping a piece. After the piece is dipped, it is immediately placed on a carrier and when the carrier is loaded, it is pushed onto one of the storage tracks in the drying room, as shown in Fig. 8.

The transfer crane, shown in Fig. 7, is of great assistance in moving the carriers in line with the various storage tracks. As the work proceeds in a continuous line through the dry room, and is taken from the opposite end for the next step in process, it is necessary to have a method of transfer from the storage tracks to the main line track which leads to the kiln building. The system of switches to accomplish this is clearly shown in Fig. 9, which illustrates the opposite end of the dry room.

In this pottery, the one elevator (shown in Fig. 13) performs all the lifting and lowering operations. This is a standard freight elevator equipped with a section of the overhead track, with loose section of track at each floor to span from the railing attached to the ceiling of the building, to the track attached to the ceiling of the elevator. In order to make the lifting of this section of track entirely automatic, an attachment is fitted to the collapsible door, which engages the track as the doors are being closed and in this manner pushes it clear of the elevator car. By means of a series of electric switches, the elevator mechanism is so arranged that it cannot be started unless the doors on both sides of the elevator are closed.

When we consider that for each complete piece manufactured, it is also necessary to transport saggers in and out of the kiln, we begin to get some conception of the many handlings through production operations. Comparing the old method of handling via the head route, as shown in Fig. 11, with the new method shown in Fig. 10, which permits a man to transport a load of from ten to fifteen pieces, we can quickly visualize the advantages gained by using this modern method of transportation. Therefore, while the output of this plant might not be much in volume, the cutting of each handling cost as much as possible and the speeding up of the work has been a big factor in assisting it to give quality products in a very competitive market.

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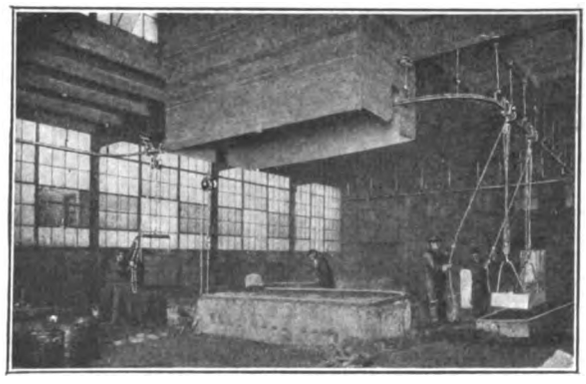
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The Industries of Sweden

(*Continued from page* 33)

Long before that time, however, the owners of the Great Copper Mine had started to devote themselves to those activities that constitute the great Swedish export industries of our days, namely ironworking and timber, together with allied industries for the exploitation of the raw materials.

Sweden is by nature a forest country. Of the total area, nearly 60 per cent. is covered by woodlands. In this respect Sweden is the leading country in Europe. The woods are consequently of great importance to the economic life of the country. Forestry and kindred industries will always provide means of earning a livelihood for a great portion of the population, and the direct yield of the country is an asset that cannot be overestimated.

For this reason legislative measures have long since been taken to insure the existence and the continual regrowth of the forest. Not only the regrowth, however, but also the growing; young wood has for some years past been an object of public care. Lumbering in young woods is only allowed for the purpose of thinning them in a fashion calculated to promote their development. With regard to this, Sweden is a pioneer country.

The utilization of the forests is to a great extent facilitated through favorable natural circumstances. Long, snowy winters and innumerable logging channels in conjunction with railways and canals provide splendid means of transportation to the great sawmills, usually situated on the coast, to woodpulp and cellulose mills and to paper mills. Sweden's export of paper and paper-pulp has been considerable, not least to America.

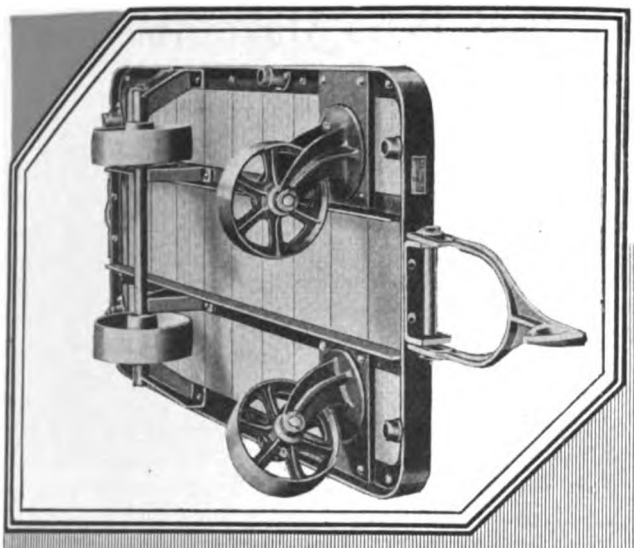
The Swedish staple industries are based not only on the raw material found within the country but also on the country's sources of power. There are some coalfields in Sweden, but they are of slight practical importance and insufficient for the needs of industry. On the other hand, Sweden has an abundant supply of water power. In this regard Sweden ranks among the first countries in Europe. The natural reason for this is the great difference in altitude between the interior parts of the country and the coast districts, and a rather rich rain and snow fall.

The total waterpower resources of the country are estimated at about ten million horsepower. Waterpower plants already constructed furnish an estimated power of about 1,300,000 turbine horsepower, and it is estimated that about 6,200,000 horsepower of the total are worthy of harnessing for industrial use. These waterpower resources are owned partly by the government and partly by individuals.

At present the question of electrification of the Swedish railways is much discussed. Besides some smaller railways, the Swedish government railway which connects the city of Lulea at the shore of the Bothnian Bay, with Norvik in Norway (the northernmost railway in the country) is run by electric power, and the Stockholm-Gothenburg railway is now in the process of becoming electrified.

About 80 per cent. of the electric energy in the country is used for industrial purposes. The large industrial companies are the principal owners of the constructed water plants.

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Scientifically Proportioned Each wheel is positioned to properly carry its share of the load. Castors and rear wheels are set in correct relation to bring about accurate trailing.

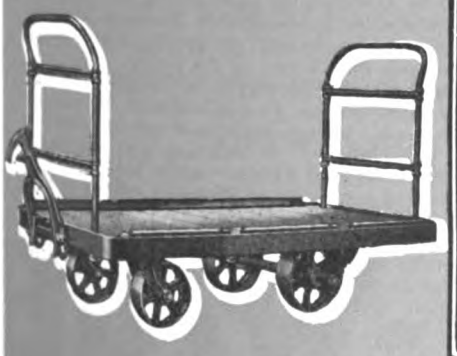


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Hitch A slight throw locks the hitch in an upright position, where it is off the floor—out of the way—and its tripping menace eliminated. Nose of hitch is smooth and rounded so it will not injure trucker's hands when used as a handle.

No Nails Floor boards rest solidly on stem of "tee" and flat side of inner angle. They are held in position by the lateral bevel strips bolted thru the "tee" frame. Not a single nail or wood screw used and consequently there are no nail heads to work out, tear and damage goods.



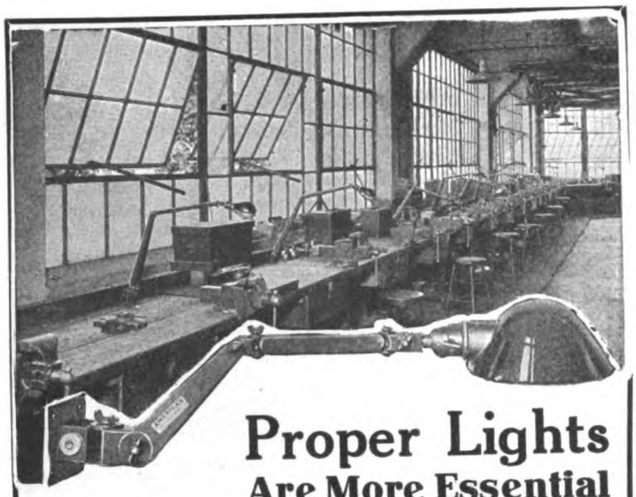
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Men Who Make American Industry

(*Continued from page* 36)

Mr. Emmons started there as bookkeeper. He had no technical training. He was born in Westchester, Conn., September 9, 1857, and after receiving a common school education he went to work in a country store handling general merchandise, where he remained until 1880. He became connected in 1881 with the American Electric Company at New Britain, Conn., which company was merged with The Edison General Electric Company in 1892 to form the General Electric Company. He left the American Electric Company in 1881 to go into a saddlery hardware business, but in 1886 became connected with the Thomson-Houston Electric Company of Lynn, and since that time has been continuously employed by the Company and the General Electric Company.

Mr. Emmons was appointed manager of the Lynn Works in 1893 and the next year came to Schenectady as assistant manager of the Schenectady Works. A year later he was appointed manager and held that position for twenty-five years. In 1913 Mr. Emmons was appointed chairman of the Manufacturing Committee, and in 1916 he became vice-president in charge of manufacturing. In addition to his other duties Mr. Emmons is president of the Employees Securities Corporation, and is an officer of several banks, realty associations and other organizations.

In announcing his decision to retire, Mr. Emmons paid a tribute to the loyal employees who have worked under him for so many years and who have helped to build the great Schenectady plant and the other Works of the Company.

President Swope, of the General Electric Company, issued the following statement:

> G. E. Emmons, vice-president in charge of manufacturing, has asked to be relieved of the responsibilities of his position, which he has carried so ably and so long.
>
> Mr. Emmons has served the Company loyally, wholeheartedly and indefatigably for almost forty years. In this time the manufacturing operations of the Company have grown from small beginnings to their present magnitude in volume of business, in number of plants and in number of employees. He has met his arduous responsibilities not only with outstanding ability, but in a manner which has won and held the respect and affection of workers in all grades of service throughout the organization.
>
> The Board of Directors, in passing upon Mr. Emmons' request for retirement, has acceded to his wishes with regret but with full recognition of the justice of the request. It has spread upon the minutes of the Board of Directors of the Company a resolution expressing its appreciation of his long and loyal service, its admiration of the manner in which his work has been performed and the affection with which the Directors, in common with his 70,000 co-workers of the General Electric family, regard him.
>
> It is the hope of the Board of Directors, officers and all Mr. Emmons' associates that in his California home, surrounded by those dearest to him, he will enjoy many years of life, of health and happiness. He will carry with him the most valuable tribute that any man can have, the enduring affection that he has won in the hearts of his associates.

Mr. Emmons will make his home in Pasadena, California, where his family has lived for several years. The affection and esteem in which he is held by business associates throughout the country is shown by the letters he has received since word of his retirement became known, wishing him many years of happiness.

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HERE is another big advantage in buying Blaw-Knox buildings. It can rain, sleet or snow. The thermometer can go away down below zero. But, regardless of weather, your building will be ready for occupancy on schedule. And it will be a building you will be proud of—a fine type of weatherproof, permanent construction.

Blaw-Knox buildings are built of copper-bearing galvanized steel, pre-fabricated units and are erected in days instead of the weeks and months required for other types of permanent building. Rustproof and weatherproof, the first cost of these buildings is less and their maintenance cost less than any other kind of permanent buildings.

If you need a one-story building of any size from a factory to a garage, from a warehouse to a filling station, let Blaw-Knox show you what it can do for you. Remember these buildings can be easily moved or enlarged. If you need more space at any time, simply order additional standard units. These will be shipped to you right from the Blaw-Knox factories. Remember, too, that the cost of the Blaw-Knox building is your complete building cost—there are no extras. Small cash payment and special financing plan if you wish.

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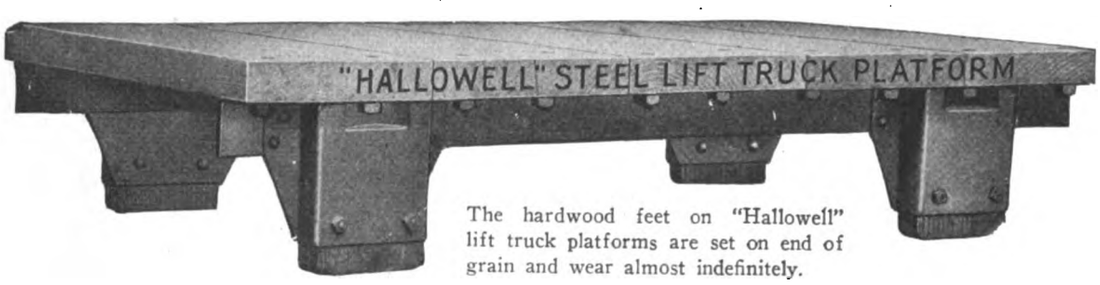
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STEEL LIFT TRUCK PLATFORMS



The hardwood feet on "Hallowell" lift truck platforms are set on end of grain and wear almost indefinitely.

Wooden feet won't kick holes in your floors!



A 3½ ton Mack truck dragged this stock "Hallowell" lift truck platform, with a 2 ton load, over a concrete floor. The floor wasn't even scratched. That the platform was good as new was proved by loading it with over 13 tons of babbitt, as the picture shows.

The hardwood feet of "Hallowell" lift truck platforms save your floors. They absorb the wear and tear of rough handling and heavy loads, whereas steel feet hammer this wear and tear into the floor.

Whether your floors are concrete or wood, it makes no difference, you can save them with "Hallowell" truck platforms with hardwood feet (patented). Steel feet cut floors to pieces sooner or later —generally sooner!

Floors are the most expensive

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HALLOWELL

STEEL LIFT TRUCK PLATFORMS

part of a plant. Their upkeep is a serious problem, as you know. It doesn't help to drag steel-footed platforms about, or have them dropped ***with a bang!*** Such treatment gouges and gashes floors, whether concrete or wood—soon ruins them!

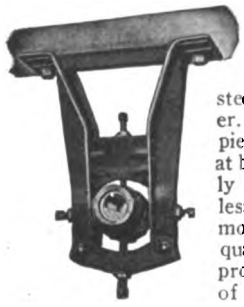
A manufacturer* recently spent many thousands of dollars to replace a floor which had been ruined by steel-footed truck platforms. Now he uses "Hallowell" platforms with wooden feet and does not care how his labor gangs handle the platforms. He knows the floors cannot be hurt and that "Hallowell" platforms themselves will stand any amount of hard knocks. *(*name on request*)

"Hallowell" platform hardwood feet are *set on end of grain* into pressed steel leg holders, hydraulically riveted to the steel stringers to which the flooring is bolted.

These hardwood blocks can be easily and quickly renewed. The steel pockets and stringers will, of course, last almost forever.

Write us today for "Hallowell" lift truck platform data. A few minutes spent in reading it will save you hundreds and thousands of dollars now needlessly spent in floor repairs.

"Pioneer" Steel Hangers



—Specify and insist upon the "Pioneer"—the original steel safety hanger. Legs are one piece, reinforced at bend—extremely rigid — weigh less — cost no more. "Pioneer" qualities have been proved by years of actual use.

"Unbrako" Hollow Set and Socket Head Cap Screws





—will stand any comparison for strength and finish, and cost less than others of equal quality. Made of carefully selected grade of steel, specially heat treated, to prevent fracturing or mushrooming. Free samples for testing.

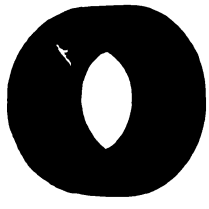
"Hollowell" Steel Bench Legs



—make it easy to build better and stronger work benches and tables, quicker and cheaper. Don't make another bench or table without getting our bench leg data. It will save you money.

"Hallowell" Steel Collars

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The secret of the other fellow's lower price

WHETHER you manufacture needles or ocean liners you face the age old problem of a competitor in the same quality class cutting prices. "How do they do it?" you ask; for you know that their production methods are no better than your own.

But therein lies the answer—your efforts are probably too much centered in one thing: making your product. When it comes to production you can meet any competition, *but*—

Suppose the other fellow's power costs him 10, 15 or 20 per cent less than yours—not at all unlikely if your power plant is incorrectly fired. Isn't it barely possible that in concentrating or manufacturing your product you are forgetting that one of your largest production items is power cost?

When you put your coal burning problem before the manufacturer of a fullfledged mechanical stoker, you receive the counsel of competent combustion engineers with long training in cutting coal costs and boiler room labor costs. The advice given by these engineers will be sound, because experience has shown them that mechanical stokers must be installed on a basis of engineering facts which foretell a definite saving.

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Greater steam demands can be met without adding to your present boiler equipment. Three boilers can be made to do the work of four through the higher combustion rate made possible by—

STOKER FIRING

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Who Pays the Fire Demon?

(*Continued from page* 35)

rigorous enforcement of sane precautions, minimize the number of fires resulting; and we can, by forethought and by prompt action, minimize the losses from those fires which do occur. We can, in short—if we wish to—save a good part of that 75 per cent. of needless fire loss of which Chief Kenlon speaks.

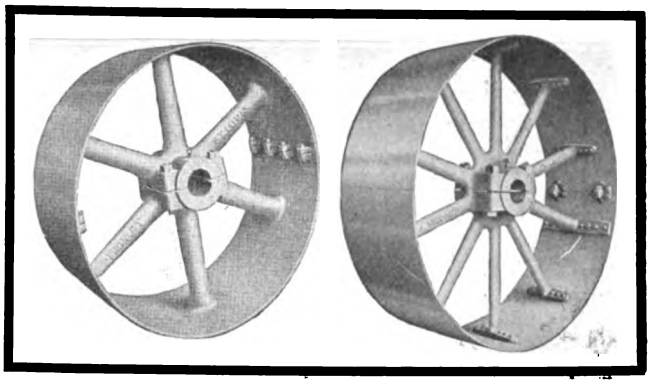
The first, and most obvious point of attack lies in fire-proof construction: the closer a building comes to being fire-proof in itself, the better protection it will afford to its contents. But here, as in the case of fire insurance, we must not consider this the beginning and the end of the matter. Many a strictly fire-proof building has been gutted by fire because it housed inflammable material. Which immediately brings to mind the subject of sprinkler protection.

Sprinklers, properly installed and regularly inspected, constitute one of the most efficient safeguards against fire yet developed. So much so, that sprinkler protection is compulsory in many cities. There are many plants, however, where water damage would be a serious factor; and in these, an efficient watchman patrol is essential. There are other plants, located in the less well policed sections, where incendiarism is a constant and very real menace; and here, for protection against intruders, it is sane common sense to fence in the entire plant. Given good fence protection, the watchman has to contend only with trouble arising within the plant.

Aside from these major precautions, we must never lose sight of the possibility that a fire *may* occur. It has been well said that even the worst conflagration, had it been discovered and attacked at the start, could have been prevented. Except in the case of an explosion, most big fires had their beginning in a relatively small blaze; and here, seconds are vital. Efficient fire-fighting equipment, *readily accessible when and where needed,* is a vital factor here. The small fire in a waste basket is a simple problem, if attacked at once; but a few minutes' delay may convert it into a blazing building.

As to the most important element of all—the human element—volumes could be (and have been) written. But the human element in the problem of fire reduction resolves itself down to one thing; a determined, unremitting campaign of education and watchfulness. Signs prohibiting smoking in dangerous locations are valueless unless strictly enforced. Cautionary signs regarding the handling of gasoline and oil—these are meaningless unless backed by positive insistence on the part of the management. Careless smoking, careless disposal of inflammable waste, carelessness in filling fuel tanks—these are individual acts; but the responsibility for them lies at the door of a management too lax or too unprogressive to devise ways for eliminating them.

Just as the determination of the men responsible for our Federal expenditures for government has brought about an immense reduction in that expenditure, so could the determination of our plant executives bring about a reduction in our industrial fire loss. Is 1925 to show the same huge increase in loss by fire as has each preceding year—or shall we turn the corner and, by intensive effort, bring this appalling waste downward?



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Five distinctly different types comprise the Medart Family of Pulleys—there isn't a situation to which we cannot adapt 100% pulley service.

1 **Cast Iron Pulleys.** Machine-molded 6" to 72". Floor molded 74" to 16 feet, 50" face.

2 **Steel Rim Pulleys.** The original steel plate face pulley. Including Cones and Drums, sizes up to 16 feet and 50" face.

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4 **"Hercules" all-steel special heavy duty pulleys, guaranteed to have no equal for unfailing service.**

5 **Iron Spider, Wood Rim Pulleys, combining maximum tractile efficiency with durability and high speed.**

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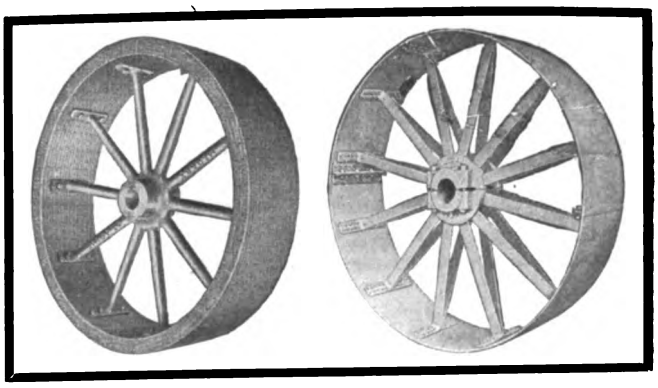
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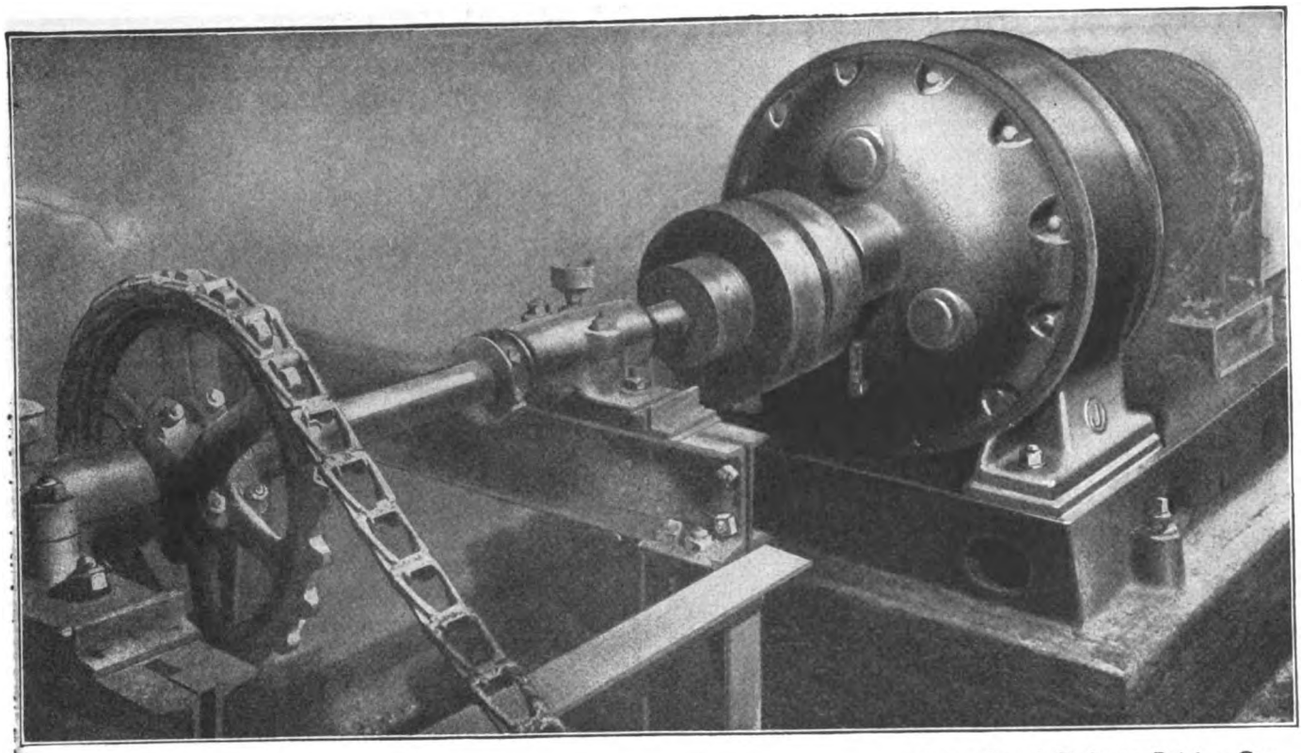
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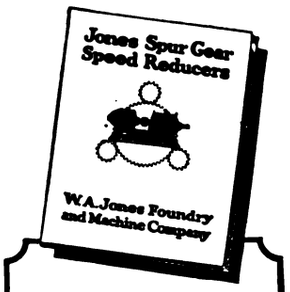
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This space and power saving unit does away with complicated and costly methods of reducing speeds. It efficiently supplants belts and pulleys, exposed gears and other complex and space using methods of reducing speeds. It eliminates alignment and lubrication problems, replacements and repairs, bearing troubles.

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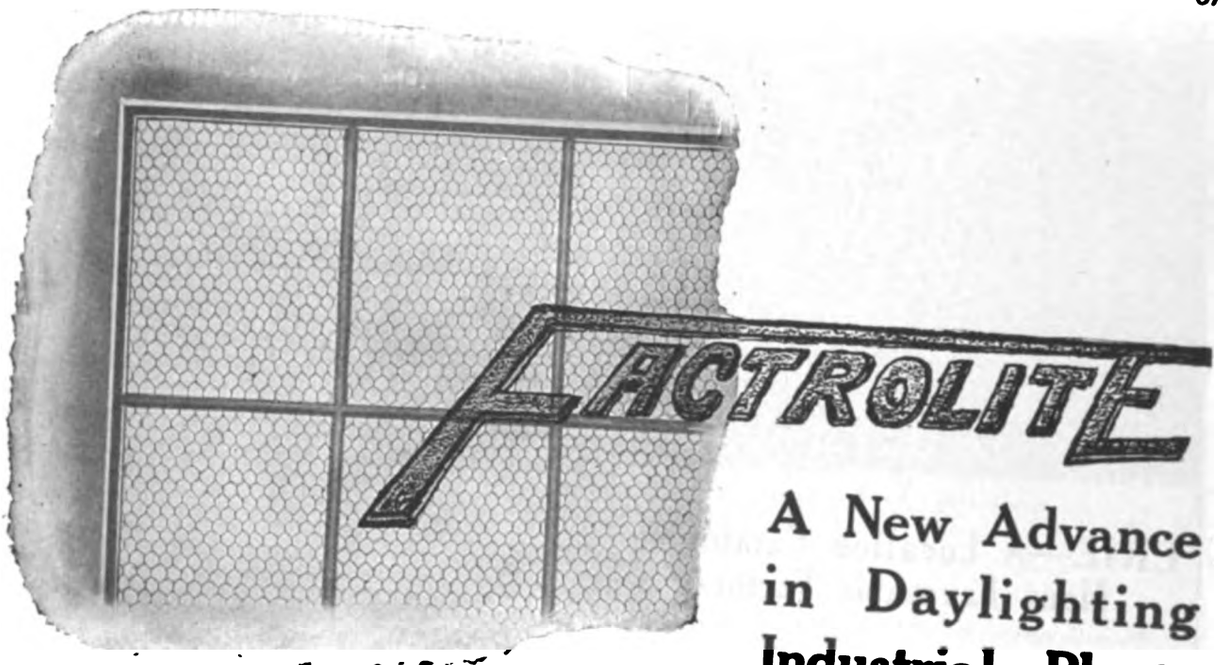
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A New Advance in Daylighting Industrial Plants

Knowing the importance of greater conservation of daylight, research work of this company has for many years been directed toward the production of a glass with high diffusing power.

Great areas of the sidewalls and roofs of modern factories are built with steel sash and glass. It has been our aim to make this expenditure for daylighting give greatest RESULTS.

In FACTROLITE there is offered to the engineering public a glass of **greatest daylighting** power.

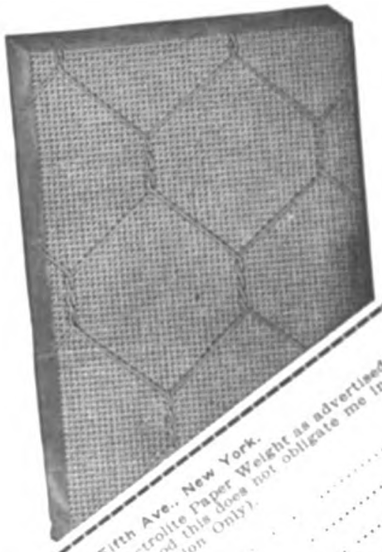
Every square inch of its surface has 900 prisms that appear like tiny corrugations. Their shape and size have been scientifically determined to promote DIFFUSION.

The United States Government used over 100,000 sq.ft. of FACTROLITE for a single great building.

We have had tests made by the Electrical Testing Laboratories which will interest every engineer.

FACTROLITE gathers daylight on dark days. It diffuses the glare of direct sunlight on bright days.

Send the coupon for full data—and a free sample of FACTROLITE.



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MISSISSIPPI WIRE GLASS CO., 219 Fifth Ave., New York.
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Aeroplane view of portion of Erie

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Information concerning available sites, industrial activity or business opportunities cheerfully given.

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They give the story of the very latest developments in Revolvator material handling equipment. To keep abreast of the times keep up with Revolvator.

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There are hundreds of smaller companies who use Revolvators. Do you? If not send for our booklets—now.

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Lifters Stackers Liftrucks Barrel Racks

REVOLVATOR CO.
322 Garfield Avenue Jersey City, N. J.

Why Industry Moves to the New South

(*Continued from page* 16)

markets, while within itself consumption leaps; and possessing two-thirds of the country's coast-line and a whole string of improved ports, it is the gateway to both domestic and foreign water-borne trade.

In an age of power, the spreading Appalachians make of two-thirds of the South practically one vast coal mine, where the price runs at three to four dollars a ton uniformly; more oil and natural gas comes from the Southern fields of Texas, Louisiana, Arkansas, Oklahoma, and West Virginia, than from any other part of the country; on a healthful hilly plateau running 600 miles from North Carolina to past Muscle Shoals, and 200 miles from Tennessee down to Georgia, a group of forward looking power companies have united by interconnection



Fig. 14. Education for the South's negroes. This is a high school for colored children at Memphis, Tenn.

an amazing system that taps a thousand falls of the hilly South's innumerable streams so that Albama river power runs the machinery of North Carolina textile mills in a water shortage and vice versa; while Virginia, Arkansas, Missouri, and every county with a hill and a river follow suit and pour millions in hydro-electric developments that, in total, not including the coming

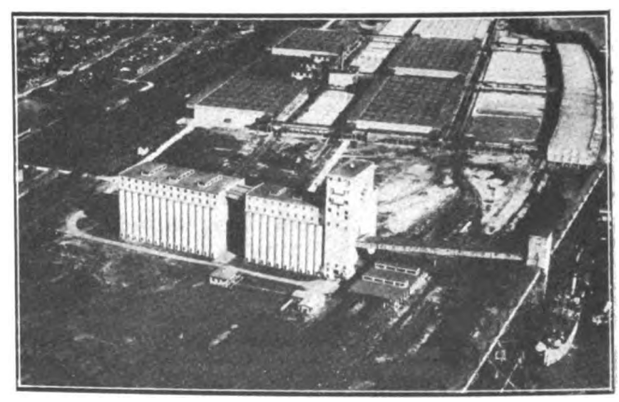


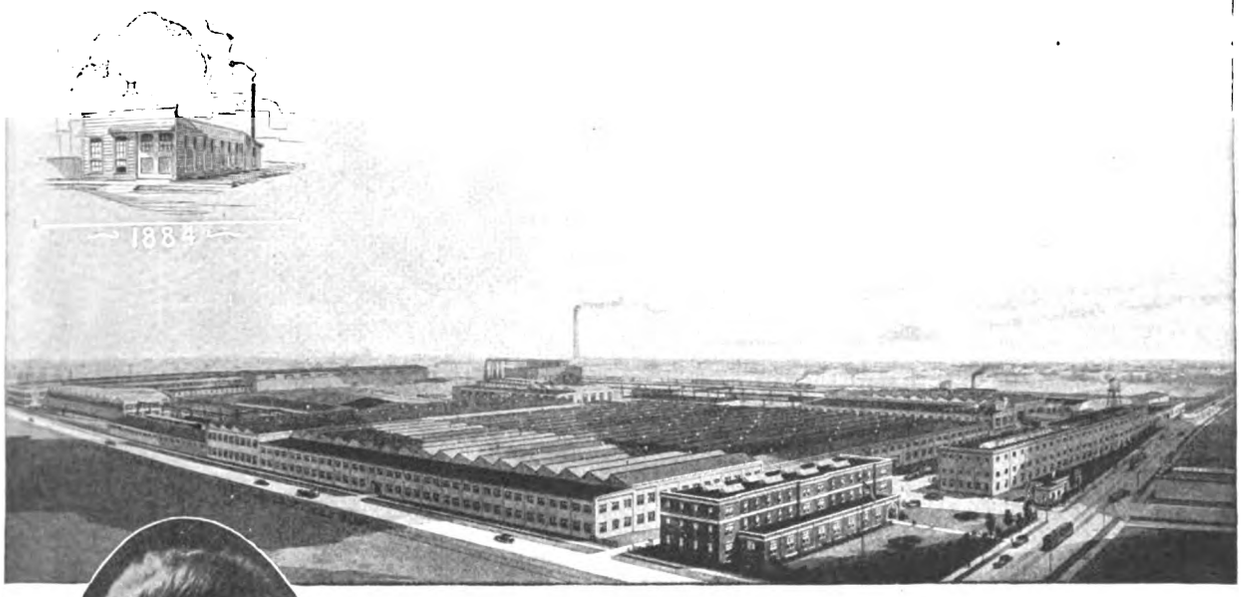
Fig. 15. The state grain elevators and cotton warehouses at New Orleans, and the publicly owned waterfront and port, are some of the causes making for the greatness of this important gateway to the outside world.

Eighth Wonder of the World at Muscle Shoals, make the South the leader in the Electrical Age in Industry.

In an age of labor, in a world-wide field of battle between classes and races thrown or forced together with-

(*Continued on page* 72)

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MR. HENRY HARNISCHFEGER *with the late Mr. Alonzo Pawling, formed a partnership 40 years ago, which later was incorporated as the Pawling & Harnischfeger Co. and now is known as the Harnischfeger Corporation. The change in name involves no changes in management, organization, policy or trade mark.*

Forty Years of Achievement

From the humblest beginning but with steadfast purpose—P&H has grown to become one of the outstanding industrial organizations in the world.

The 40 years of achievement just ended mean as much to the user of P&H equipment as to the maker.

Resources, manufacturing facilities, engineering and designing ability, and experience make doubly sure the quality, effectiveness, long wearing qualities and economy of operation of P&H Electric Traveling Cranes and Hoists—and the various products included in the excavator line—Shovels, Draglines, Corduroy Cranes, Trench Excavators and Backfillers.

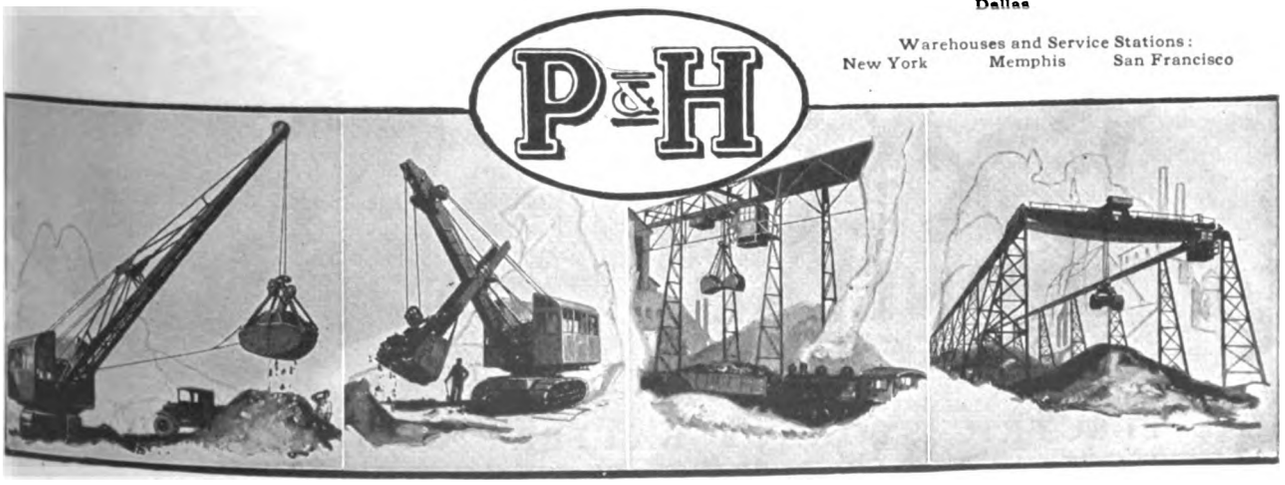
A plant and an organization well able to serve promptly and obligingly—with experience that years alone make possible. P&H equipment is conservatively rated—with no claims made that time will not substantiate.— ***You can depend on*** **P&H.**

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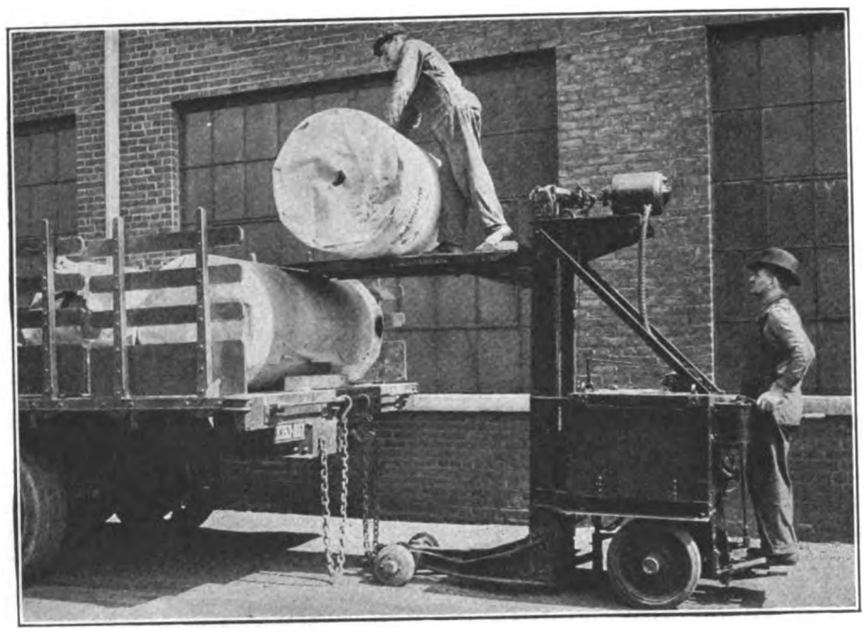
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This tier-lift industrial truck never balks at steep ramps, sharp turns or heavy loads. When the whistle blows it is still on the job with speed aplenty. It is driven by an Exide-Ironclad Battery. This battery helps speed up movement of materials and work in process all through the plant, keeps down handling costs on every ton. Its power efficiency is high—cost of recharging is low.

What do you want *most* in a truck battery?

You know what the most essential qualities are, but do your batteries possess them?

IN the battery box of the electric industrial truck or tractor lies a chance to trim down handling costs. Successful men in charge of truck and tractor fleets know that storage batteries can make or mar their record for prompt, economical handling of materials and work-in-process.

Many of these men equip entire fleets with Exide-Ironclad Batteries. They find that this battery's operating characteristics enable truck or tractor to do more work at lower cost.

These five essential qualities of the Exide-Ironclad Battery directly help pound down handling costs:

1—Reasonable first cost

2—Ability to deliver a flood of reserve power when needed

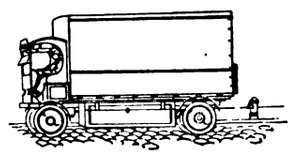
3—Ability to keep the truck going at good speed, even in the afternoon

4—Ruggedness, long life, freedom from repairs

5—Economy in recharging.

Aren't these what you want most in a battery? Try an Exide-Ironclad Battery in one of your trucks. Compare the cost per month and the work it does.

Before you buy a battery, get all the facts regarding the power-full, trouble-free, economical Exide-Ironclad Battery.



Wherever goods are delivered by electric street trucks Exide-Ironclad Batteries help speed up deliveries and bring down the cost for each delivery.



Exide
IRONCLAD
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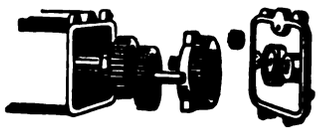
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"RAISE PROFITS"

Carrying Congoleum 9 Years!

EUCLID for PERMANENT PERFORMANCE

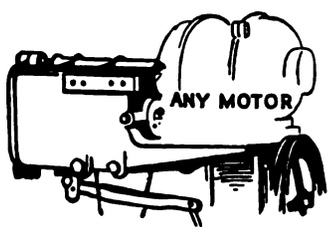
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No delicate parts.
Skilled mechanic not required.
Disassembled without removing hoist.

SAFE

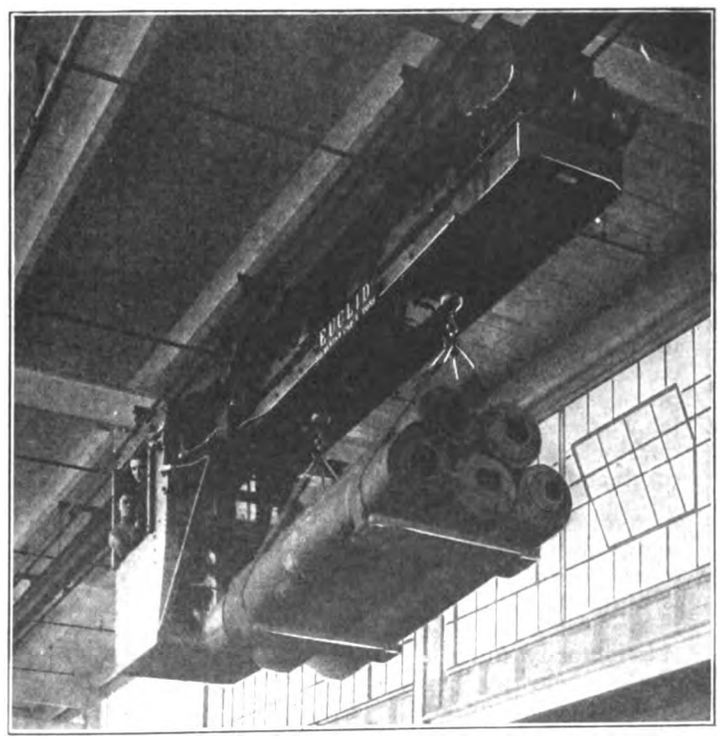
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Frame one piece—accurate alignment.
Dependable factor of safety.
Unfailing brakes and limit switches.



STANDARD

Any motor fits a Euclid.
Parts enclosed in oil bath.
All parts to jig—interchangeable.

LOW HEAD ROOM
ACCURATE CONTROL



Showing One of 3 Euclids.

"Two Euclid 2-ton cranes, equipped with operator's cabs, have been in use for over 9 years," says the owner.

Constantly overloaded—severe service 7 days a week—24 hours per day—is their average duty.

"Because of the performance of these cranes we recently installed a THIRD EUCLID."

Every Euclid user tells the same general story.

Why not solve YOUR lifting problems once and for all with a Euclid!

It will surely "raise YOUR profits."

Send for "Euclid Utility." It tells the story of Euclid in the largest factories.

THE EUCLID CRANE & HOIST COMPANY

EUCLID, OHIO

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(*Continued from page 68*)

out understanding or common purpose, where the accumulated and unforgotten wrongs of hideous empires of the past breed a sullen labor of diverse tongues and creeds, the South stands out with a pure American breed of people who speak one tongue, know only one country, and have no heritage of past oppression to kill the faith in each other that alone will solve their problem of capital and labor. A mild climate and a decentralized and uncongested activity make for a low cost of living so that wages of twelve dollars for women and twenty dollars for men go a lot further than in other parts of the country. The South's child labor decreases as it is found not extremely profitable, while the fifty-five hour week is not considered as important as the efficiency of the native labor.

In an age where great material resources are necessary, the South booms along with a still enormous lumber supply, opening opportunities to furnitures of all kinds, boxes, cooperage, auto bodies and wheels, a growing paper and pulp industry with 65 mills; cotton is so plentiful that the large mill industry it has developed now in turn is bringing in silk and woolen mills, men's and women's clothing, rugs and carpets, linen goods, and the whole textile and garment industry; the large deposits in many places of iron ore, limestone, and the everpresent coal, make national engineers predict the everincreasing expansion of the iron and steel business in the South, while the enormous program of highway

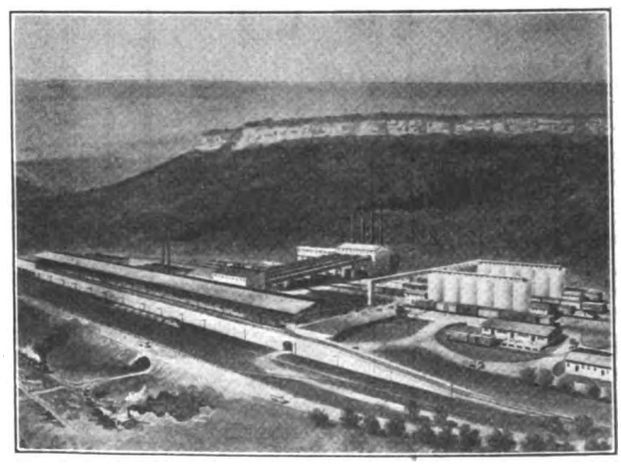


Fig. 16. This impressive landscape showing the Signal Mountain Portland Cement Co. plant at Chattanooga, Tenn., illustrates a growing industry throughout the South, and also the general hilly character responsible for the abundant lumber and frequent waterpowers.

and building development in which this section leads all others opens up immediate opportunity for structural steel mills, bridge works, and iron and steel articles generally; and the numerous propinquities of limestone, shale, and coal are creating new cement plants in quick succession to use these resources to fill the great demand for road and building material. The new Signal Mountain Portland Cement plant at Chattanooga is an example.

Clays of many kinds dot the Southern terrain and the movement of glass plants to the South and the growth of the pottery, porcelain, and enameled ware industries give some idea of the opportunities in the whole range of clay and sand and quarry products. The aluminum

(*Continued on page 77*)



We are specialists in deep drawn work with metal up to a half inch in thickness.

Consistent Quality Infinite Variety

Uniformly high quality is maintained throughout the great variety of Truscon Pressed Steel Parts for industrial purposes. Truscon engineers and laboratories guarantee consistent quality in this infinite variety of products.

Above are illustrated a few of the many pressed steel parts that have been produced by Truscon. There is almost no requirement of industry in pressed steel that Truscon cannot satisfactorily fill. Our operations include shearing, blanking, punching, forming, drawing and pressing.

Truscon production is on so large a scale that a real economy is assured you. We will gladly cooperate if you will return the coupon designating your particular problem.

TRUSCON STEEL CO., YOUNGSTOWN, O.

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CONCRETE REINFORCING
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Brookville Locomotive in Action

A Revelation in Efficiency and Economy!

The Brookville Fordson Locomotive has been scientifically designed to make 100% use of Fordson power and mechanism, and is the ideal locomotive where a dependable industrial haulage system is desired.

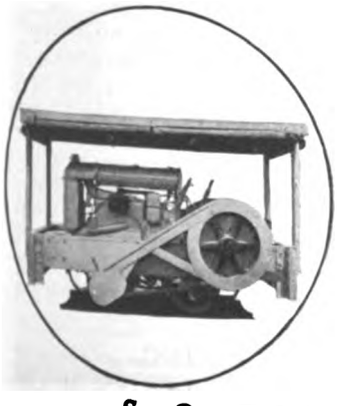
Small drive wheels, short wheel base, spring suspended thruout—irrespective as to how rough and crooked the track, Brookville will give satisfaction for loads within its capacity. Can be used over rail as light as 16-pound section.

Sold, as far as possible, thru Authorized Fordson Agencies. We furnish the complete locomotive chassis; the Fordson Dealer the Fordson Proper. No alteration of Fordson mechanism—no machine work on chassis—a novice can install the Fordson to chassis.

Write today for Bulletin B-1. Our engineering department is also at your service towards helping to solve your haulage problems.

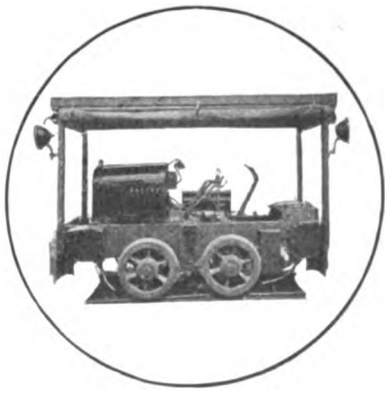
Brookville Truck & Tractor Company

BROOKVILLE, PENNSYLVANIA.



Specifications

Brookville Locomotives are manufactured in two types—the Brookville Fordson Locomotive and the Brookville Ford Ton Truck Locomotive. The Brookville Fordson Locomotive uses as its power-unit the standard Fordson Tractor, positively without change or alteration other than discarding the wheels and complete front axle and steering assembly. The Brookville Ford Ton Truck Locomotive uses as the power-unit the Ford one-ton Truck throughout, including Ford motor, transmission and differential. Write for a copy of our folders, which give complete specifications and measurements of both types and the various models of each type.



See Our Exhibit at the Ford Power Equipment Exposition, New York

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Four places you can cut maintenance costs

FOUR parts of an industrial building require more than their share of attention. These four are the floors, roof, painted surfaces, and exterior walls.

On these trouble spots, you can cut your present maintenance costs to a surprisingly low level. Here is how hundreds of large industrial plants all over the country have done so.

Concrete floors—Under friction and wear, tiny particles of a concrete floor break off and float into the air. These silicate dust particles are as harsh and sharp as fine emery. They are breathed into workers' lungs; they grind away on your machinery; they damage your merchandise and equipment.

But still worse than the dust itself is the trouble that follows in its wake. For as the dusting process proceeds, holes, hollows, and worn patches develop in the concrete floor. Soon you have to patch the floor—which is unsatisfactory at best, or you have to lay a new surface. Production is held up and the repairs are costly.

It is a simple matter to have concrete floors that will not dust and wear—floors granite-like in their hardness. A treatment with Lapidolith will do the trick. Lapidolith is a colorless liquid chemical that is flushed on the floor like water. It penetrates the concrete, fills the pores, binds the loose particles, hydrates the free lime, and changes the coarse-grained structure to a fine, even, dense surface of crystalline formation.

Lapidolith can be used on old or new floors. If it is applied at night, the surface is ready for business by morning. A Lapidolized floor withstands the hardest kind of wear. It is dustproof, wearproof, waterproof.

Exterior walls — Does water seep through your exterior walls in a driving rainstorm? Is their original beauty hard to maintain? Then you will be glad to know about Hydrocide Colorless. This material is a perfect waterproofing for brickwork. It penetrates the surface; it does not run in hot weather, for it contains no paraffine; it does not collect dust; and it can be painted. Best of all, it retains the natural beauty of any surface, for the presence of Hydrocide Colorless can not be detected on a wall. If you would have warm dry interiors for all time, use this material.

Leaky roofs—One tiny leak in a roof can cause a lot of damage and annoyance. It is easy to stop that leak quickly and permanently. Just apply a little Stormtight, in semi-liquid form if the leak is small, or plastic Stormtight if the hole is large. This thick, adhesive, rubber-like compound can be applied by anyone, over any roofing material.

It waterproofs an entire roof surface just as easily as it does a small leak. Many an old roof that was about due for renewal has been made as good as new by a coat of Stormtight.



Floor repairs do not worry the Continental Can Company. The quarter million feet of concrete floor in its Jersey City plant are dustproof and wearproof. The entire floor surface has been treated with Lapidolith. About 30,000 square feet of the interior is also painted with Cemcoat.



Plants such as this are saving hundreds of dollars by covering their old roofs with Stormtight, instead of re-roofing. The men are covering some of the sizable holes with plastic Stormtight. The semi-liquid material is applied with brush.



The interior of the Whitaker Paper Company's building in Baltimore, Md., is painted with Cemcoat. Photograph shows part of the eighth floor, comprising the office, sales and display room. Note the bright cheerful appearance and the absence of glare.

Painted surfaces — Would you prevent your white walls from turning yellow? Would you stop paint from scaling off brick, plaster, and concrete surfaces? Would you paint less often and use fewer gallons when you do paint?

Then use Cemcoat, the industrial paint that stays white longer than any similar paint on the market. Cemcoat resists heat, fumes and gases. You can wash a Cemcoated wall over and over again, and each time the paint looks as fresh and white as when it was applied. Because of its body Cemcoat usually requires one less coat than other paints on a given surface.

Furthermore, it is specially made to resist free lime — always present in a brick or concrete wall. As a rule this lime causes paint to chip and scale within a short time. Cemcoat adheres to brick, concrete or plaster just as easily as it does to wood. Made for exteriors as well as interiors, in white and colors, and in gloss, eggshell or flat enamel finishes.

Send for literature giving further details on any of the above products

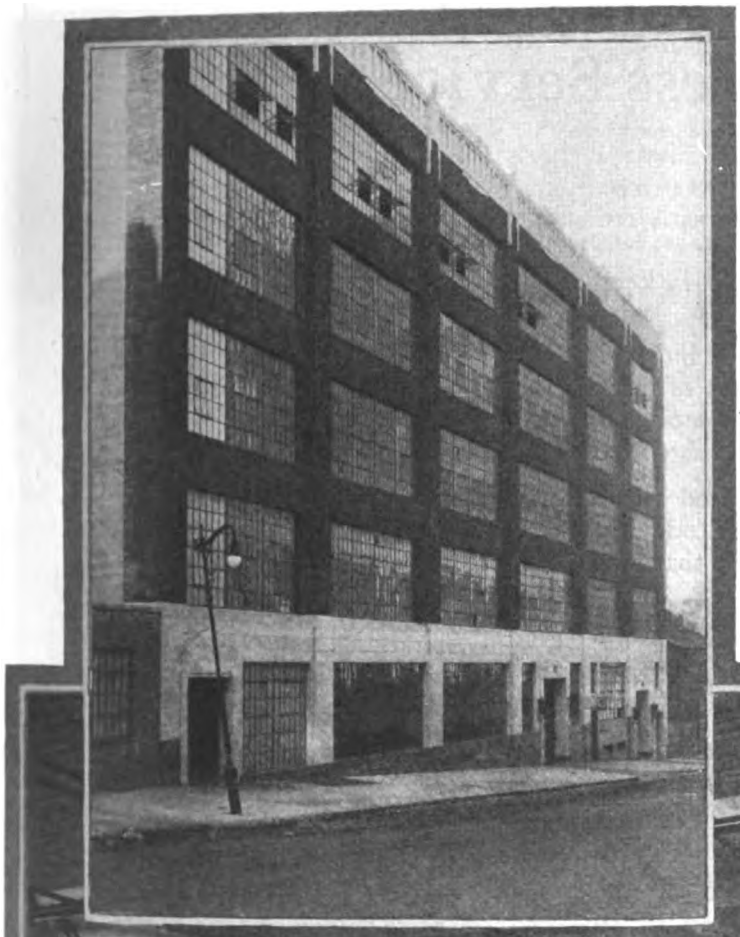
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NORTON FLOORS

Ramps That Are Permanently Slip-proof



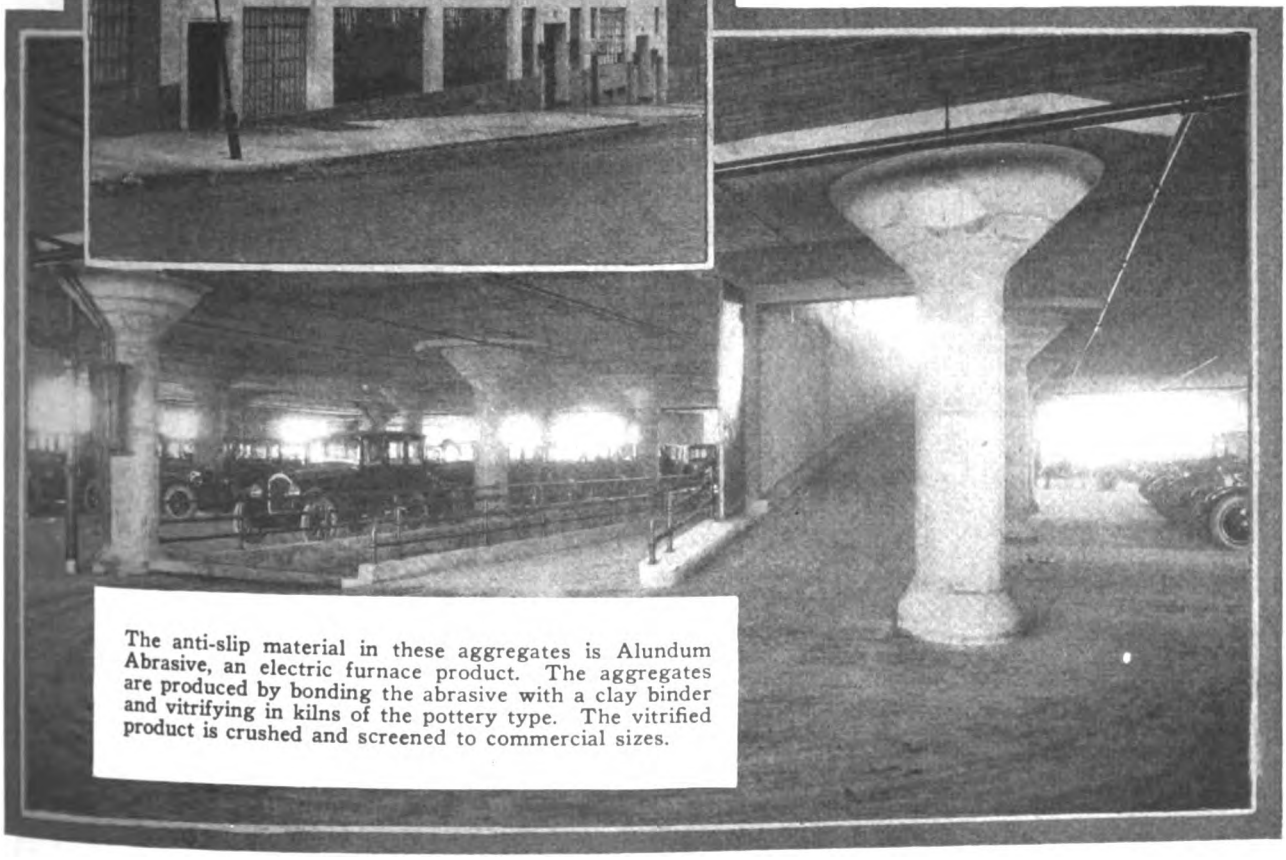
Ramps connect all floors of the modern Studebaker Service Station at 131st Street, New York. The ramps are surfaced with Alundum Aggregates imbedded in concrete. The result is a flooring that is durable and permanently slip-proof. The oil, grease and water always present on a garage floor does not lessen the slip-proof effectiveness.

There are places in many industrial plants where ramps are desirable for the most efficient handling of materials but to obtain a suitable flooring has been a problem. Norton Floors assure a surface that is permanently slip-proof and will stand up under heavy traffic.

NORTON COMPANY
Worcester, Mass.

New York Chicago Detroit
Philadelphia Hamilton, Ont.

T-126



The anti-slip material in these aggregates is Alundum Abrasive, an electric furnace product. The aggregates are produced by bonding the abrasive with a clay binder and vitrifying in kilns of the pottery type. The vitrified product is crushed and screened to commercial sizes.

ALUNDUM TILES, TREADS AND AGGREGATES

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(*Continued from page 72*)

clays of Arkansas are the greatest in the world.

The agricultural and live stock South is still growing, and fine tanneries that used to send their leather to the North now prefer to sell it to a new and spreading industry of trunks, valises, shoes, and leather gloves.

The vast variety of chemicals and alloys found in the South makes the fertilizer industry a large one, and opens



Fig. 17. The South has two-thirds of the sea-coast and most of the oil. An example of both is this great center of the Gulf Refining Co. at Port Arthur, Texas, the country's fifth port.

the door to chemical factories, electro-chemical works alongside cheap electric power like the Aluminum Company of America in Tennessee and other lines.

Zinc, copper, tobacco, and many other resources bring new industries. The first two are creating a brass center at Knoxville.

Matchless resources, native American labor, unequalled power, three-fourths of industry on an elevation of over 500 feet in a resort climate, leading ports, and a great building and highway program calling for years of intensive internal development as well as of outside trade, the South today is the Klondike and the El Dorado of American Industry, while to the capitalist or workmen who wishes to weave the love of humanity into his daily task, it still remains the land of gallant gentlemen and fair womanhood.

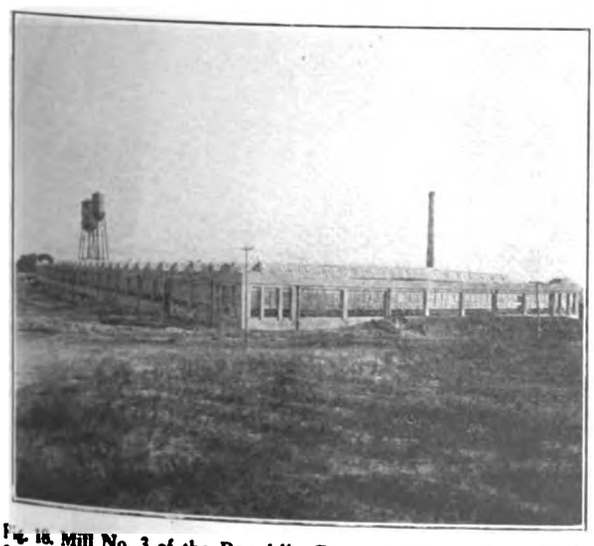


Fig. 18. Mill No. 3 of the Republic Cotton Mills at Great Falls, S. C., uses both raw silk and cotton in making mixtures. It gets electric power from the great falls nearby.

"The preparation of metal surfaces for further finishes desired is just as important as the finish itself."

STOP THAT RUST

RUST-I-CIDE

TRADE MARK REG. U.S. PAT. OFF.

THE CHEMICAL RUST DESTROYER

COMPOSITION PAT FEB 3, 1920

Does All These Things Safely—Surely—Cheaply

CHEMICALLY KILLS RUST, and provides a priming coat for painting the rougher surfaces such as Structural Iron and Steel, railroad cars, ships, buildings, fire escapes, window sash, smoke stacks, pipes, radiators, tanks, etc.

PRODUCES A SURFACE FREE FROM CORROSION, for the further finishes of the finer surfaces such as automobile bodies, sheet steel, metal office furniture, safes, files, machinery, tools, etc.

REMOVES RUST-SCALE CAUSED BY HEAT TREATING—Metal articles such as drills, reamers, taps, screws, bolts, nuts, bushings, automobile parts, etc.

PROVIDES A NON-CORROSIVE FLUX FOR SOLDER—Electrical and radio work—Tinned, Iron or Galvanized Sheets, etc.

AND MORE
"THE PRODUCT OF A THOUSAND USES"

Write us for "The Better Way in the ELIMINATION OF CORROSION." Order a gallon at our risk—satisfaction or no charge.

THE RUSTICIDE COMPANY

412 Frankfort Ave. Cleveland, Ohio.



POWELL Visible Steel Tote Pan Rack

A DISTINCTLY new idea in material handling equipment, sturdily constructed of heavy steel.

Built on the unit plan—additional units may be added. Furnished in aisle type as illustrated—also in wall type units.

A particular feature is the visibility of materials contained in the tote pans. Very essential where foreign labor is employed and where indexing of pans is impracticable.

Write for illustrated folder and prices.

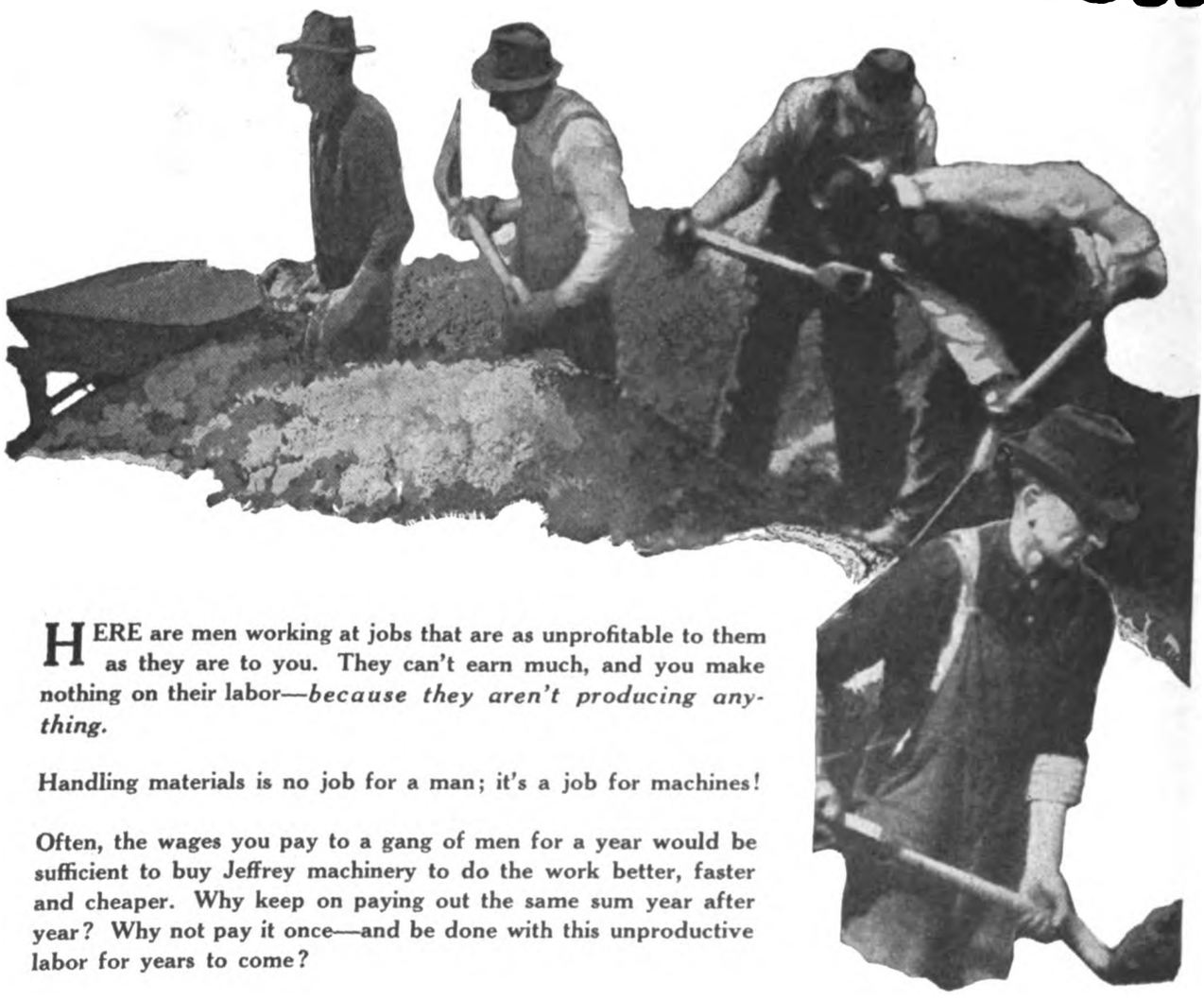
The POWELL PRESSED STEEL CO.

HUBBARD, OHIO

SUBURB OF YOUNGSTOWN

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Give These Men Productive



HERE are men working at jobs that are as unprofitable to them as they are to you. They can't earn much, and you make nothing on their labor—*because they aren't producing anything.*

Handling materials is no job for a man; it's a job for machines!

Often, the wages you pay to a gang of men for a year would be sufficient to buy Jeffrey machinery to do the work better, faster and cheaper. Why keep on paying out the same sum year after year? Why not pay it once—and be done with this unproductive labor for years to come?

Not only is this economical for the employer, but it releases men who are going to be sorely needed on productive work, where they can earn better wages and have less arduous tasks.

The Jeffrey Manufacturing Company
Columbus, Ohio

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It's Metal Fingers Think

COMBINED with Everedy's brute power is intelligence. A bottom as well as a top limit stop, *adjustable to any point,* prevents overrunning of load in either direction. These metal fingers that think, protect load and hoist when workmen forget.

Its few moving parts are easily accessible. Accessibility—this one feature has sold hundreds of Everedys in competition with practically every other hoist.

Low head room. Load carried at all times plumb with center of suspension. Roller bearing equipment throughout, "Alemite" lubrication.

For sound value, this Everedy Single Drum Portable Electric Hoist stands in a class of its own. No hoist of like quality has ever been offered at such a low price. READING CHAIN & BLOCK CORP., READING, PA. MANUFACTURERS OF *Everedy Portable Electric Hoists, Reading Multiple Gear Chain Block, and Reading Traveling Cranes.*

Everedy

ELECTRIC HOIST »» *multiplies man power*

Modern Ball Bearing Manufacture

(*Continued from page* 25)

number. How much difference may be allowed? If the bearing is just right where the diameter between points of contact is 0.5002", will it also be just right when a little later, the diameter between points of contact is 0.4998"? We have here a difference of 0.0004". It is not difficult to see, then, that it is highly important to be able to make balls that will be very round indeed. It is commercially impossible to make a ball that is *perfectly* round—whose diameter is *precisely* the same in whatever direction it is measured. It is approved practice that balls shall be true to size, however measured, to ½ of 0.0001"—that is, to plus or minus 0.00005". The human hair has a diameter equal to some ten times this amount. This is so minute a measurement that a ball that is right at 70° F. may appear to be wrong if held in the mouth until it has acquired the temperature of the body (98.4°). There are only a few things manufactured of metal which are made with a higher degree of accuracy. One of these few things is the frightfully expensive gage block used in setting master gages.

The Three Chief Methods

I may cite here three chief procedures for the manufacture of high grade balls. (1) Blanks are cold severed and cold pressed from annealed cold-drawn steel wire by a continuous method. (2) Blanks are hot forged from hot rolled bars. The size of the finished ball controls more or less the selection of method.

Let us suppose that by one of the three processes the ball has been roughly formed. It is now a trifle oversize. This excess allows for a slight reduction in ensuing processes. In this way, any film of decarbonized steel that may have been produced in a hot process is removed. The roughly-formed balls are now subjected to an annealing which removes strains and stresses in the steel. These may have been produced by the mechanical processes employed in forming the ball.

Balls of the sizes used in standard practice range from a diameter of ⅛ inch to 2½ inches. Sizes smaller and larger are made, but they are considered as specials. One large eastern plant has a capacity of producing the equivalent of 200,000 balls of the ½-inch size per day. Cold pressing is a more or less standard method for forming balls ranging up to ½-inch. Beyond this size, up to 1½-inch, the method of hot pressing is used. Forging is employed for sizes larger than these.

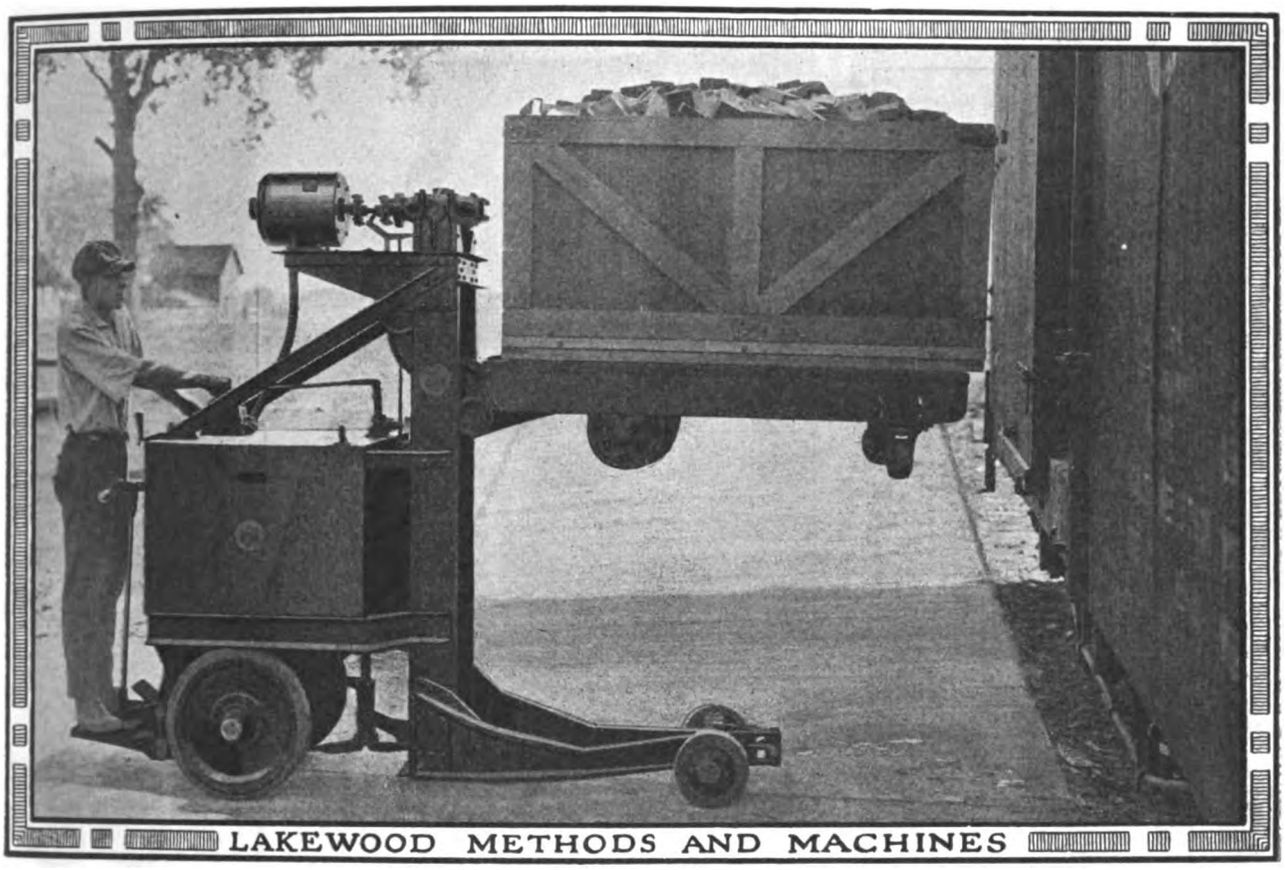
A standard heading machine arranged for ball forming is a type of apparatus used in this work. That is to say, the ball is automatically pressed into shape between dies. Such a machine may make 75 strokes per minute —that is, presumably 1¼ balls per second.

A representative method of doing the hot pressing is to heat the slugs in an automatic gas furnace and then to form the balls in a vertical press. A ball of 1 inch diameter is formed at the average rate of 2 seconds.

In the case of the still larger balls—over 1½-inch—the bar stock is heated up in a furnace near the machine, each operator attending to his own heating. A strap hammer is employed for the forging. This apparatus

(*Continued on page* 84)

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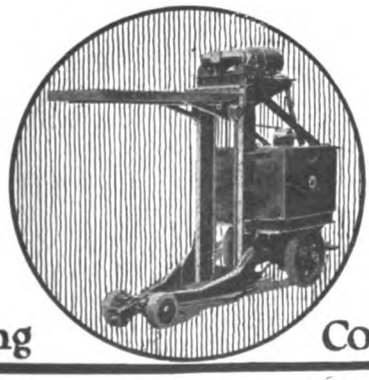


Tier-Lift Cuts Costs for Body Manufacturer

A body manufacturer, with plants in two cities was confronted with the problem of shipping small parts from one to the other.

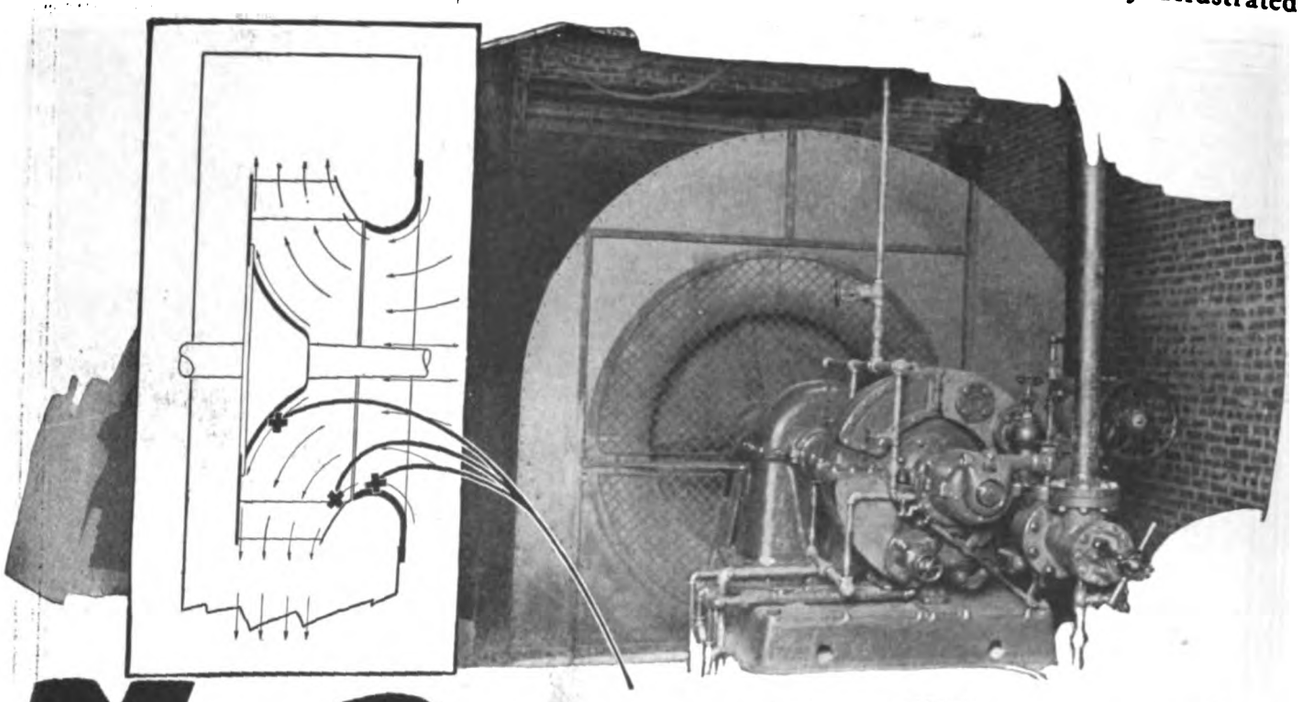
Wooden boxes, fitted with casters, and a Lakewood Tier-Lift Truck, have proved a satisfactory solution. The Tier-Lift carries the loaded boxes to the freight cars and lifts them onto the car floor. Being fitted with casters, they are easily rolled to place in the car.

At the assembly plant another Lakewood Tier-Lift takes the loaded boxes from the cars to the stock-room. Both of the Tier-Lifts are put to many other uses. In this one operation alone, however, an attractive saving has been made.



The Lakewood Engineering Company, Cleveland U.S.A.

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No Power Lost at these points

The crosses in the above diagram mark the places in a high speed fan for mechanical draft where power is usually lost. They indicate the points where eddies and turbulence develop in many fans, resulting in lowered efficiency.

The streamline design of the American Blower fans eliminates turbulence at these points. The inlet is so designed that the air does not eddy. The shroud on the wheel and the curved hub guide the air in a gradual curve to the vanes of the fan. The air follows a true streamline course from the time it enters the fan until it leaves.

Streamline design gives American Blower High Speed Fans an efficiency that results in definite economy of power. Information on request.

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See our complete line of air-handling equipment at the American Blower exhibit

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(379)

American Blower

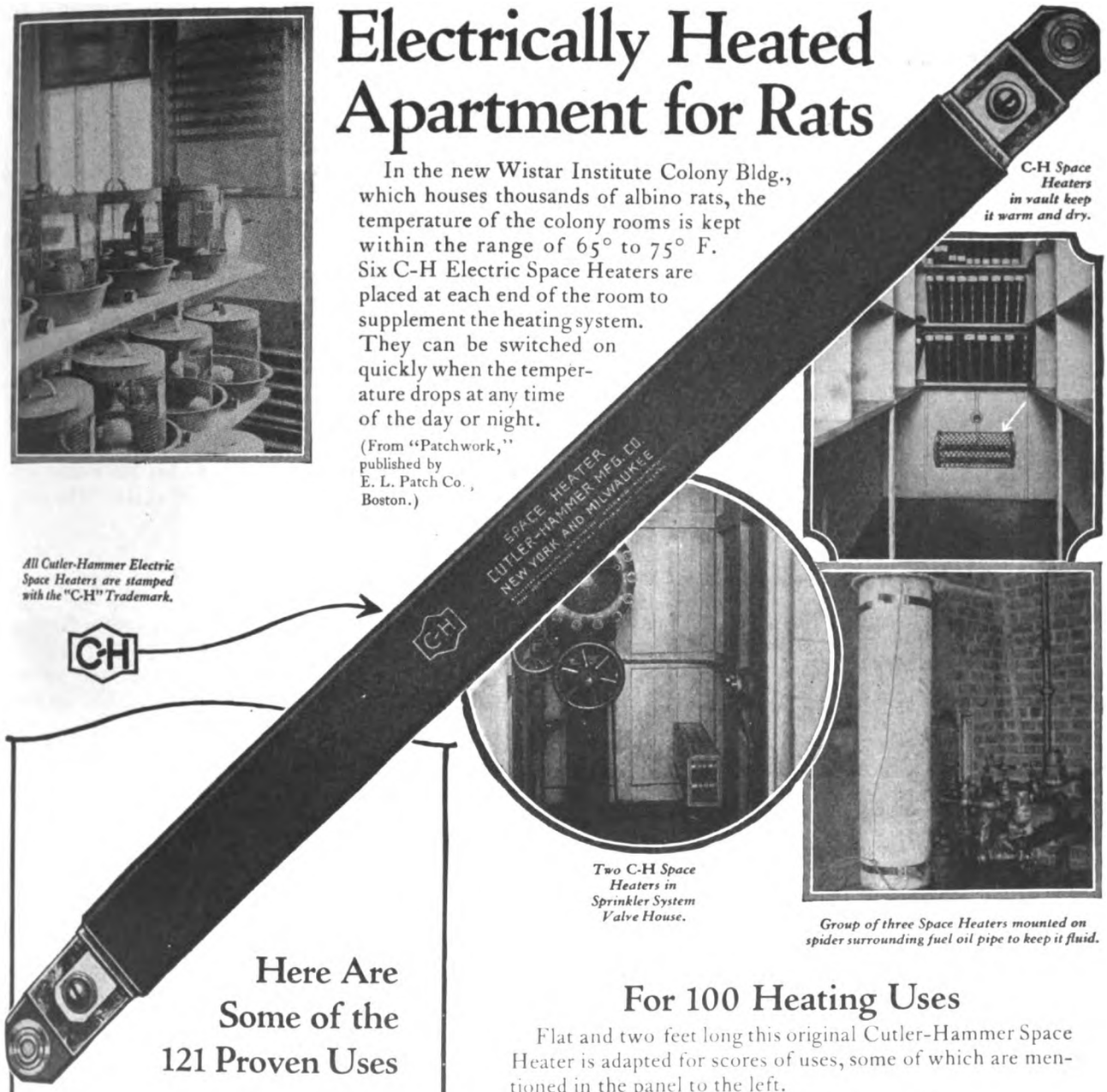
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In the new Wistar Institute Colony Bldg., which houses thousands of albino rats, the temperature of the colony rooms is kept within the range of 65° to 75° F. Six C-H Electric Space Heaters are placed at each end of the room to supplement the heating system. They can be switched on quickly when the temperature drops at any time of the day or night.

(From "Patchwork," published by E. L. Patch Co., Boston.)



All Cutler-Hammer Electric Space Heaters are stamped with the "C-H" Trademark.

C-H

C-H Space Heaters in vault keep it warm and dry.

Two C-H Space Heaters in Sprinkler System Valve House.

Group of three Space Heaters mounted on spider surrounding fuel oil pipe to keep it fluid.

Here Are Some of the 121 Proven Uses

Sprinkler Systems	Incubators
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In connection with Ventilating Systems	Warming Ovens
Crane Cabs	Foot Warmers
Coal Tipples	Substations
	Pits
	Manholes

For 100 Heating Uses

Flat and two feet long this original Cutler-Hammer Space Heater is adapted for scores of uses, some of which are mentioned in the panel to the left.

Clean, Safe, Easily Installed
500 Watts (like an Electric Iron)

The insulated mounting eyelets make installation easy. Connection may be made to either direct or alternating current light or power circuits.

If your electric supply jobber cannot supply you promptly, get in touch with the Cutler-Hammer branch office nearest you.

Send for this booklet



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Will 25 years' experience in making security wheels in all sizes and diameters from 6 inches to 6 feet help you in solving your wheel problem?

This vast experience covering every phase of wheel construction and the metals which go into them—developed by trained engineers is at your disposal.

No problem is too great or too small. Our job is to make wheels of every description and utility—and for every industry.

The 36 kinds of wheels here enumerated, are but an indication of our capacity. Why not allow us to prove our willingness to serve you. Write and tell us your wheel problem. Let us mail our catalogues.

THE GENEVA METAL WHEEL CO.
121 Railroad Street **Geneva, Ohio.**



(*Continued from page* 80)

is equipped with dies having a series of depressions, so that it is possible to form a number of balls at one time. The forging occupies about a half-minute. How many balls will be formed during one operation of this length depends upon the size of the balls. A string of eight ¾-inch balls may be formed at the same time. To get the average time per ball, we divide 30 seconds by 8 and get 3¾ seconds. This hammer strikes 225 blows per minute or 112 blows per ball of ¾ inch size, since all eight are under the hammer for thirty seconds. However, the balls require trimming before they can be considered even rough spheres. In order that this operation may be carried out, the string of balls is taken from the one machine and put between dies in another machine. Here, the superfluous material is trimmed off and the balls drop into a receptacle placed to receive them. The annealing which follows these various processes of forming may be carried out as follows. The small balls—up to ½ inch—are heated in a stationary gas furnace. The intermediate and large ranges of sizes are treated in a rotary furnace. These furnaces vary in size. The maximum may be 17 feet in length.

Grinding the Balls

The balls are still in a rough stage. In order to get rid of fins, etc., the rough balls are now given their first grinding.

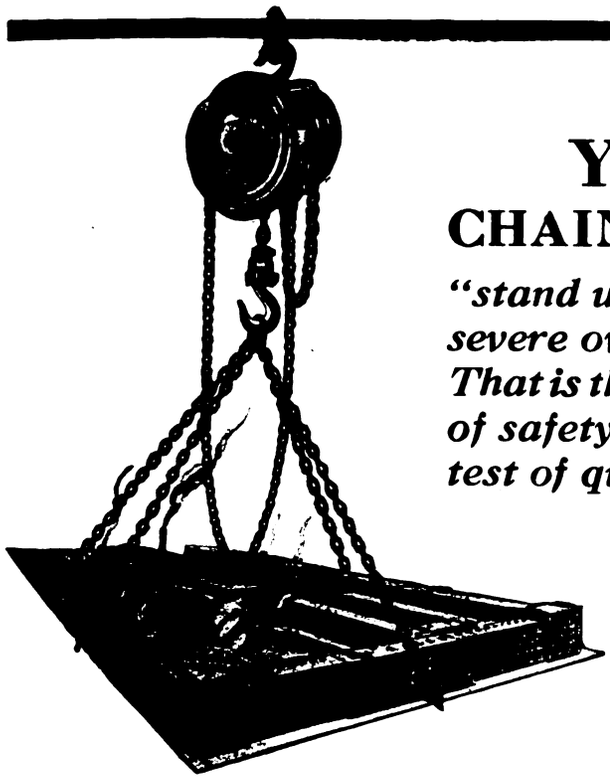
The grinding at a prominent works is done in rather a novel manner. The grinding wheel is rotated in a horizontal plane. At the rim, the speed will be 1 mile per minute. This speed naturally diminishes towards the center. The balls are held to the rapidly moving side surface of the wheel in such way as to permit of their rotation. That is to say, there is a holding device known as a chaser. The balls shift over the wheel surface and are not allowed to remain in one position, as this would result in an uneven wearing of the grinding wheels. The chaser ring itself has a rotation of its own, turning at the rate of 60 r.p.m. in the direction opposite to that of the grinding surface. The influences to which the balls are subject keep up a constant change of the axis of ball rotation, and this results in the balls being ground all over their surfaces. This is of course necessary. The balls are held with the assistance of two beveled-edge retaining rings. A lot of balls are ground at a time, the chaser ring being filled until the balls are close together. The pressure on the grinding wheel is controlled by means of a hand screw which causes the wheel to shift vertically.

It is to be understood that the balls are still soft. They must naturally be hardened, after which they must be ground again, as the hardening could hardly be depended upon to proceed without causing at least a minute degree of distortion. The grinding which is carried out immediately after hardening, in this factory, is done upon the same type of grinding apparatus as before, although a somewhat different size of grit characterizes the wheel. This is a dry process. Next comes another grinding operation which is carried out on a special machine. Oil and an artificial abrasive are employed in this work, which is a lapping operation performed between two cast iron plates. The balls are carried by a driver and the speed is 500 feet per minute. There is still another grinding operation to which the balls are subjected. It

(*Continued on page* 86)

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TRADE **YALE** MARK



YALE
CHAIN BLOCKS

"stand up" under severe overload. That is the requirement of safety. It is the test of quality.



Every part of a Yale Block is made strong enough not only to handle the normal working loads, but with a reserve capacity for accidental overload.

Note the illustration of a Yale standard *one piece gear and pinion*. The driving pinion and shaft transmits all the pressure and torque required in raising or lowering the load. This part, in the Yale Block, is machined from a single drop-forging and then heat-treated. The bearing surfaces on the shaft are ground to 1-1000 of an inch. The gear teeth are accurately cut to mesh with the planetary gears.

And every other part in a Yale Chain Block is built to the same exacting specifications. Known wherever chain blocks are used for their great strength and reliability, the standard of comparison.

Yale Material Handling Equipment includes Spur-Geared, Screw-Geared, and Differential Chain Blocks, Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment. To acquire locking control, security and convenience throughout the factory, use Yale Master Keyed Locks.

YALE
Chain Blocks, Electric Hoists } For Lifts
I-Beam Trolleys, Industrial Trucks } For Shifts

The Yale & Towne Manufacturing Co.

Stamford, Conn., U. S. A.

YALE MADE IS YALE MARKED

YALE **Hoisting and Conveying Systems**

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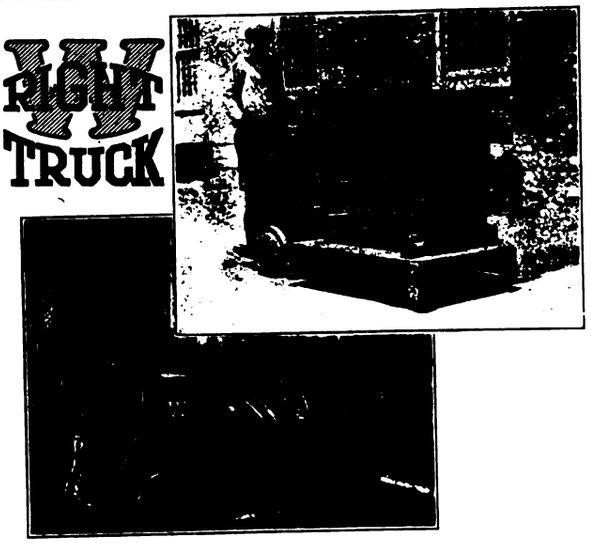
(*Continued from page* 84)

appears that with this concern this last grinding was formerly carried out in such manner that the balls were rolled between two cast iron plates, oil and an abrasive powder being employed. It was found, however, that the plates wore unevenly, so that it was necessary to replace them rather frequently. It was ascertained that grinding wheels themselves could be made of such hardness and density as to permit them to be substituted for cast iron wheels. However, the machines using the very hard grinding wheels have one to a machine. The wheel is rotated in a vertical plane, its plane surface being used in the grinding. Near the grinding surface is a metal plate which does not rotate but parallels the rotating grinding surface of the wheel. There are, in the face of the plate next the grinding wheel, a number of annular grooves, which are provided as runways for the balls. A plate suited for one size of ball may be used for a while and then replaced by one suited to another size, the grooves being varied more or less to correspond to the size of the balls which are fed into a raceway which delivers to the groove in the stationary plate. They remain in the groove of the stationary plate until nearly an entire revolution round the plate has occurred. In the meantime, there will naturally have been many rotations of the grinding surface. The balls, after having gone round nearly the entire circuit, are engaged by a picker which diverts them into a suitable trough, from which they are returned into the plate grooves to receive another grinding. It is said that this system produces accurate balls. It is not to be understood that the grinding wheel does not suffer. As a matter of fact, grooves are formed in it. These are kept from getting too deep by an occasional dressing of the grinding wheel face. The small amount of metal removed at a time by the action of the wheel against the balls may be gathered from the fact that the balls are ground over and over again until they have been in attendance upon the machine for a period ranging from 16 to 20 hours.

Heavy pressure—7,000 pounds—is exerted against the balls by means of a screw.

It may be of interest to know just about how much metal is taken off by the several grinding operations. When a ½-inch ball comes from the forging operations, its diameter will be perhaps 0.535. This is something over 1/32 inch over-size. However, this excess occurs on two radii, so that one-half is really the thickness of the shell to be taken off. The first grinding, the rough operation carried out before hardening, brings the diameter down to about 0.514 inch. The first grinding after hardening reduces the diameter, say, to 0.507 inch. The oil lapping between two cast iron plates brings the diameter to about 0.503 inch; while the final grinding between grooved plates and grinding wheel produces close to 0.500. The actual diameter sought is 0.5002. By means of a suitable measuring device, the balls are ground so as to have diameters lying in the range 0.500225. They are, however, not yet to absolutely final size. They are brought to this by the polishing operation. This is really a grinding process, the only difference being that the size of abrasive grain is in polishing excessively small. It is not desired that any balls shall be over-size. The final size for the ½-inch balls of this company is understood to be fairly stated as 0.500000 inch down to 0.499975 inch. This means that the diameter is correct within 0.000025 inch.

WRIGHT TRUCK

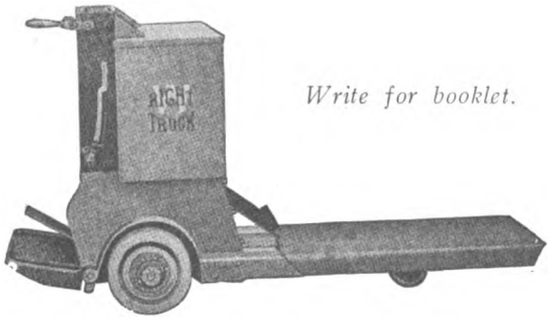


A Wright Electric Goes where other Trucks are not Accessible

Narrow aisles, exceedingly short turns and other places where the ordinary truck cannot manoeuvre are made accessible with this most compact little truck.

The larger sized platforms can also be used on a Wright Electric Truck.

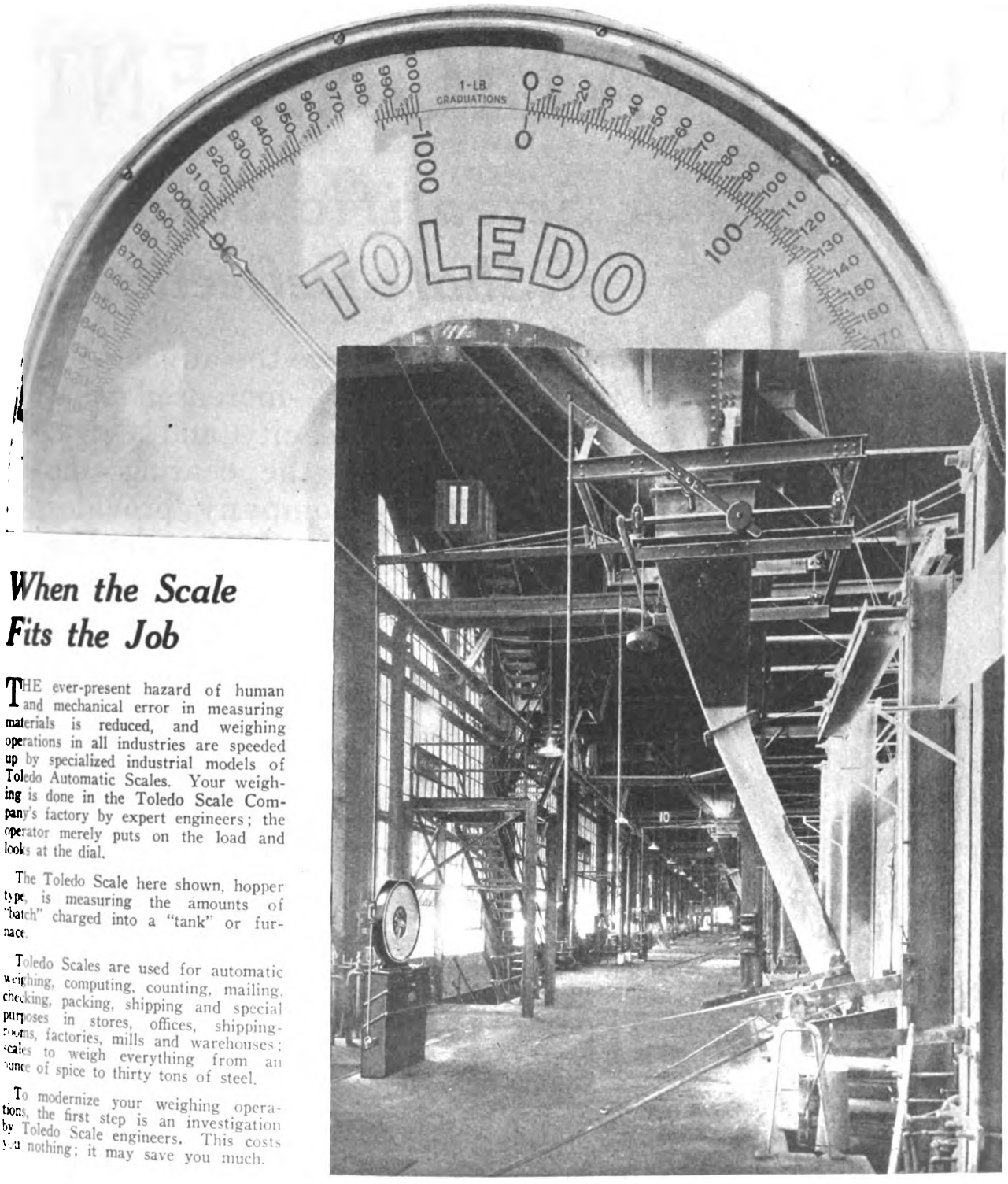
The Wright Electric Lift Truck has an exceedingly short turning radius (5 feet outer wheel). The Wright will go in places that are inaccessible to the average electric truck on the market. Thirteen complete lines of sizes to meet every industrial condition.



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Wright-Hibbard
Industrial Electric Truck Co., Inc.
Main Office and Factory
Phelps, N. Y., U. S. A.

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THE ever-present hazard of human and mechanical error in measuring materials is reduced, and weighing operations in all industries are speeded up by specialized industrial models of Toledo Automatic Scales. Your weighing is done in the Toledo Scale Company's factory by expert engineers; the operator merely puts on the load and looks at the dial.

The Toledo Scale here shown, hopper type, is measuring the amounts of "batch" charged into a "tank" or furnace.

Toledo Scales are used for automatic weighing, computing, counting, mailing, checking, packing, shipping and special purposes in stores, offices, shipping-rooms, factories, mills and warehouses; scales to weigh everything from an ounce of spice to thirty tons of steel.

To modernize your weighing operations, the first step is an investigation by Toledo Scale engineers. This costs you nothing; it may save you much.

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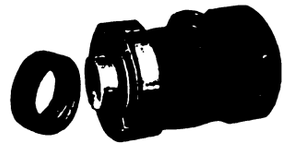
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SINGLE SELF-ALIGNING PILLOW BLOCK

Ball-and-socket alignment of bearing in housing.



HANGER BOX

Alignment of box in screws of frame.



DOUBLE SELF-ALIGNING PILLOW BLOCK

Ball-and-socket alignment of box in frame.

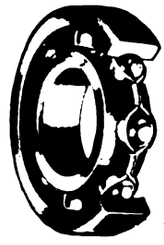
In order not to sacrifice the advantages of the deep raceway—increased radial and thrust load capacity and a rigid normal position for the bearing—the Fafnir Bearing Company provides against shaft deflection by the aligning of the entire bearing in its housing or the housing in its frame.

This principle is called unit-alignment, the compensation of shaft deflection without sacrifice of the sound design principle of the deep raceway ball bearing.

The entire Fafnir Power Transmission line is constructed on this principle. It makes this line the scientific means of transmitting power cheaply and easily.

The Fafnir Bearing Co.

Detroit New Britain, Conn. Chicago



FAFNIR

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Aiding in the Production of Yellow Cabs

REELITES are playing an important role in the production of motor cars at the Yellow Cab Mfg. Co's plant, Chicago, where they are used extensively in transmitting power to the portable tools for drilling, grinding, etc.

With a Reelite the cord is always clean, unkinked, and off the floor, because it is reeled in a container which automatically pays out and retrieves the cord as needed. Away from the heels of workmen, wheels of trucks, an uninterrupted flow of current is assured. Further, it saves time and trouble, protects the cord from wear, and helps maintain production schedules. Wherever installed Reelite quickly pays for itself.

Like the Yellow Cab and many other leading manufacturers where Reelites have gained recognition for production you, too, can probably profit by their use. Our engineers will gladly tell you how. Consult them.

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KEEPS PORTABLE TOOLS IN SERVICE

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TODAY, in thousands of busy barber shops, men ease themselves into friendly chairs and have their hair cropped in a better, quicker way by an electric clipper. Thanks to the fractional horsepower motor—which made this ingenious device possible—another visionary possibility has become a practical reality. Thanks to Dumore fractional horsepower motors and to Dumore advisory engineers, the Moore Electric Hair Clipper—pioneer of them all—has won and retained the leadership of its field.

Perhaps our Engineering Department can do for you as they did for Moore. The personnel of this department have for years been accustomed to adapting fractional horsepower motors to new applications. If you are developing a motor driven device, tool or appliance and find a perplexing power problem retarding its success—or if you are a manufacturer planning to change the power unit you are now using, you will find the advice of these experts to be extremely useful. Write them any time—they welcome problems that aren't easy.

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Type-SAX
⅓ h.p. motor with special base. Operates on A. C. or D. C.



Type-A—Stripped
⅓ h.p. Cast iron frame, enamel finish, Babbitt bearings, wick oil feed. Operates on A. C. or D. C.



Type-D
¼ h. p. Cast iron frame. Enamel finish. Plain bearings. Grease cups. Operates on A.C. or D.C.



No. 3GM—Stripped
¼ h. p. Aluminum frame. Enamel finish. Norma Bearings. Ventilated. Operates on A. C. or D. C.

Dumore Fractional H.P. Motors

Better Lighting Means Better Work

(*Continued from page* 29)

admitted that she was and wondered why I asked. Daylight lamps with reflectors were substituted, and about a month later, when I called there again, she told me her headaches had stopped.

Every industrial plant has its own individual lighting requirements, but any adequate system must conform to the following requirements:

1. Sufficient illumination on the work;
2. Proper direction of the light rays;
3. Freedom from direct and reflected glare;
4. Good diffusion and avoidance of sharp shadows;
5. Steadiness of light source;
6. Proper color of walls and ceiling;
7. Reliability;
8. Economical operation and maintenance.

The most generally applicable system of lighting is called "localized general" because of the arrangement which provides for a high intensity over machines or benches and a lower intensity for the remainder of the room. The maximum intensity is thus delivered on the work from the proper direction, while the spread light takes care of the surrounding areas. This system has practically all the advantages of the drop light in getting the light where it is most needed, while at the same time, the lighting units are out of reach, are not likely to be broken or tampered with, and the whole room is well illuminated.

Where especially high intensity is occasionally required for special jobs, the portable unit is very convenient. This is usually kept in the tool room when not in use and is checked out the same as a tool when needed.

Modern artificial light sources are very brilliant and should never be used alone. This brilliancy is an unavoidable accompaniment of their high efficiency, but they can be so chosen, mounted, and equipped as to minimize the resulting glare.

It has been said that light may be produced by lamps without reflectors, but not by reflectors without lamps. This is very true, but it is also true that lamps without reflectors not only waste light but also are a cause of ineffective lighting due to glare. Glare, in turn, not only produces an injurious effect upon the eye and reduces its acuity, but also produces a tiring effect upon the entire body. Reflectors, therefore, serve two purposes, that of distributing and diffusing the light most efficiently on the working plane and that of protecting the eyes of the workmen.

There are many types of reflectors on the market, only a few of which need be discussed here. A study of industrial lighting several years ago led to the conclusion that the planning of a satisfactory system could be simplified if there were available a type of reflector that would meet the needs of most installations. It was determined to develop such a reflector and, since a unit consists of a reflector and a lamp, joint action was undertaken by reflector and lamp manufacturers and through the coöperation of illuminating engineers of the leading manufacturers, what is known as the R L M dome reflector was agreed upon. Reflectors of this type are now

(*Continued on page* 94)

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REGULATING APPARATUS

Has been installed by hundreds of the Leading Manufacturers of America and they swear by the results secured.

Several Million Boiler Horse Power is continuously controlled—the

HAGAN WAY—
which means EFFICIENTLY

Millions of dollars have been saved for users of Hagan apparatus.

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Combustion and Chemical Engineers

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In Prizes

—to executives and engineers who have reduced their power costs

Our editors want you to tell our readers *how you did it.*

So they are offering $350 in prizes for the most helpful accounts of actual experience in reducing power costs and eliminating power wastes, due to improvement in operation or equipment or both.

First Prize	**$100.00**
Second Prize	**$80.00**
Third Prize	**$60.00**
Fourth Prize	**$50.00**
Fifth Prize	**$35.00**
Sixth Prize	**$25.00**

Literary ability is not essential in this contest. What we want are the facts, showing how you reduced your power costs, expressed in the fewest possible words.

In addition to the above prizes, all manuscripts accepted and published will be paid for at our usual space rates.

For particulars and suggestions regarding this contest, write to:

Power Contest Editor
The Engineering Magazine Company,
120 West 32nd Street,
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Contest closes February 1st, 1925

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The New 1925 Catalogue, now ready for distribution, contains a wealth of information on equipment necessary for the industrial railway system.

It illustrates a variety of types and sizes of cars, trailers, bodies, buckets, tote boxes, turntables, track, ties and other equipment ready to aid you towards economical materials handling methods. It is more than a mere catalogue.

It may contain the solution to your handling problem. Send for your copy.

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Main Office & Works

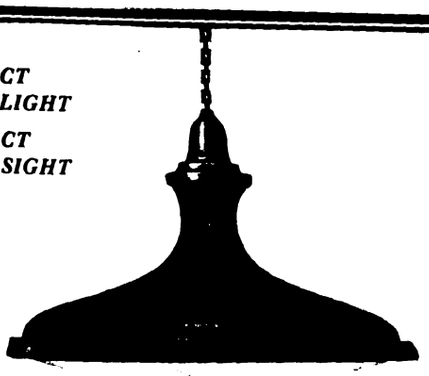
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CORRECT THE LIGHT
PROTECT THE SIGHT



THE LENS THAT REPRODUCES DAYLIGHT

So long as work must be done under artificial light, the uncontrolled rays of the electric lamp will cause eyestrain, impair efficiency and reduce production.

The 9 A. M. Lens

Corrects the yellow, red and orange rays of the various types of electric lamps to a spectroscopic reproduction of sunlight at the best—that of early forenoon. Lenses of special chemical compounds and reflectors designed to correctly reflect the rays meet light requirements of the widest range. A soft, clear, white light similar to that at 9 A. M. is provided at all times regardless of outdoor conditions.

We would like to prove this to you in your own plant —in shop or office. And remember we are ready to do so without any obligation on your part; at no expense.

Drop Light Units 9-inch for ordinary purposes, 12- and 15-inch for overhead lighting. Desk Units, Extension Fixture Units for Drafting Rooms and Color Matching Units.

Sign the coupon and mail it to us today—no obligation is incurred.

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Use the Coupon for the trial offer

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100 Broad Street, New York

Please send us one of your units for trial. It is understood that we are to try it out at no expense to us.

Name.....
Address.....
Company.....
Position.....

(*Continued from page* 90)

produced by different manufacturers, but all are labeled R L M (meaning Reflector and Lamp Manufacturers' standard) and are frequently tested by the Electrical Testing Laboratories, of New York, which was appointed the testing authority.

The R L M reflector is dome shaped and is well adapted for general lighting; that is, to afford uniform illumination over an entire workroom. It affords an adequate distribution of light, is efficient, easy to clean, and so designed that direct glare is reduced to a minimum.

The glass top dome has similar properties, but the small section of glass inserted near the holder transmits a portion of the light upward, producing a more cheerful atmosphere and promoting safety in the operation of belting and shafting.

Glassteel diffusing reflectors afford good illumination, soften shadows, and reduce direct and reflected glare. In this type, light is permitted to reach the ceiling, which softens the contrast between the working plane and the space above the reflector, while the steel casing protects the glass bowl, lessening the chances of breakage. The total light output of the glassteel reflector with a clear lamp is the same as that of an R L M reflector with bowl enameled lamp of the same size.

Where only a low degree of illumination is needed on vertical surfaces and a high degree is desired on the horizontal ones, particularly if the elimination of shadows is a secondary consideration, a bowl reflector may be more desirable. The deep bowl reflector directs the light strongly downward, thus affording excellent illumination on the working plane, but the room is likely to appear dull and cheerless because of the small amount of light on vertical surfaces. Light colored surroundings reflecting and diffusing the light tend to overcome this condition to a certain extent.

For special purposes, elliptical angle and symmetrical angle reflectors are provided and there are many special reflectors and accessories.

Prismatic, mirrored, and dense opal glass reflectors are also used and many of them are very attractive, but it is evident that the danger of breakage is much greater than where metal reflectors are employed.

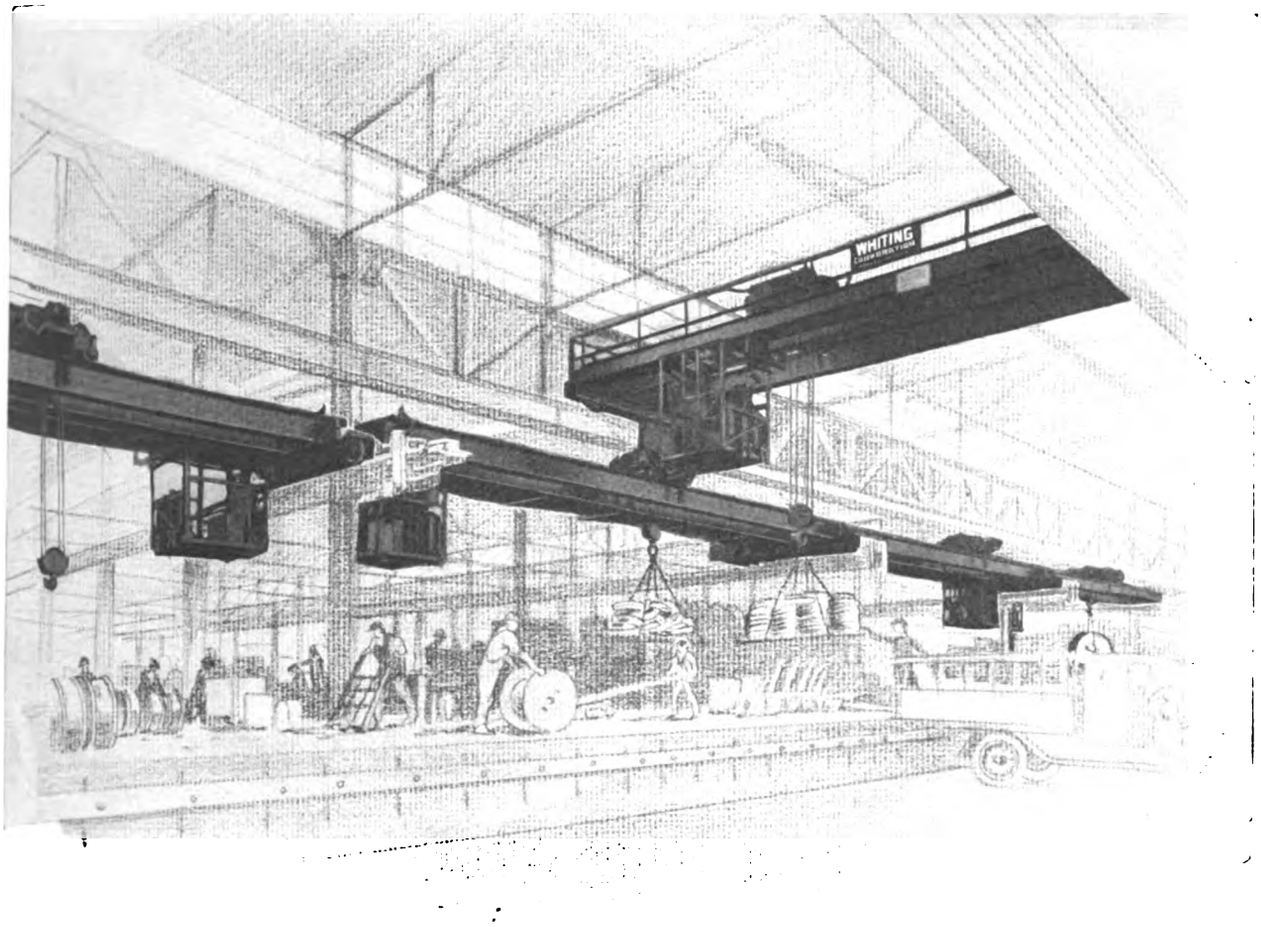
No matter what kind of lighting system one may install, though, one of the chief assurances of adequate and economical lighting is a regular maintenance schedule. Dirty reflectors, walls and ceiling darkened by smoke, blackened lamps left in service as long as they will burn, empty sockets, unobserved burnouts, and replacements with lamps of wrong size are prime causes of inadequate illumination. I have found the absorption of light by smoke, dirt, and dust to be as high as 75 per cent. This means, of course, that the consumer is getting only 25c worth of light for which he pays $1.

In a well-kept paper plant I found the depreciation to be 15 per cent. in just two months. In a foundry or machine shop depreciation is much more rapid. Lighting units in such plants should be cleaned every four days, or at the very least once a week. The tendency in many of them, though, seems to be to pay no attention to the lighting system till the lamps disappear entirely in the smoke, grease, and dust, then to pitch in and dig them out.

The manager of one factory told me, in reply to a

(*Continued on page* 98)

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One 10-ton and five 5-ton Whiting Overhead Traveling Cranes, span 46 ft. 6 in., in warehouse of Steel Sales Corporation, Chicago. These are common capacities for general use, although Whiting electric cranes are made in all capacities up to 250 tons. We are equipped to design and build cranes of any type, for any service.

An Overhead Item that Reduces Overhead-

An electric traveling crane is an overhead item. It travels overhead, out of the way, where it can do all the heavy lifting and carrying without interfering with operations below. It handles any kind of material—up or down, from place to place.

The crane's operation is an "overhead" item, but it is offset by a much larger item — reduced handling cost and increased production. You need this kind of "overhead."

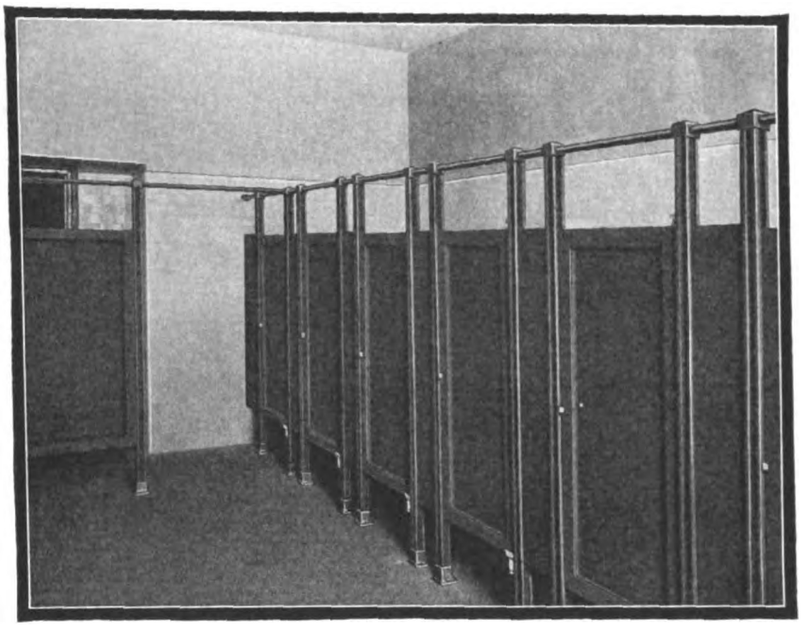
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WHITING

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WHEN the question of toilet or office partitions comes up, remember that Sanymetal can give you definite assistance on arrangement, type of installation, and cost, Long experience, serving every conceivable kind of partition needs and conditions, in industrial buildings, enables us to clarify your ideas—to put them down in black and white. This cooperation we are glad to furnish you, without a thought of any obligation.

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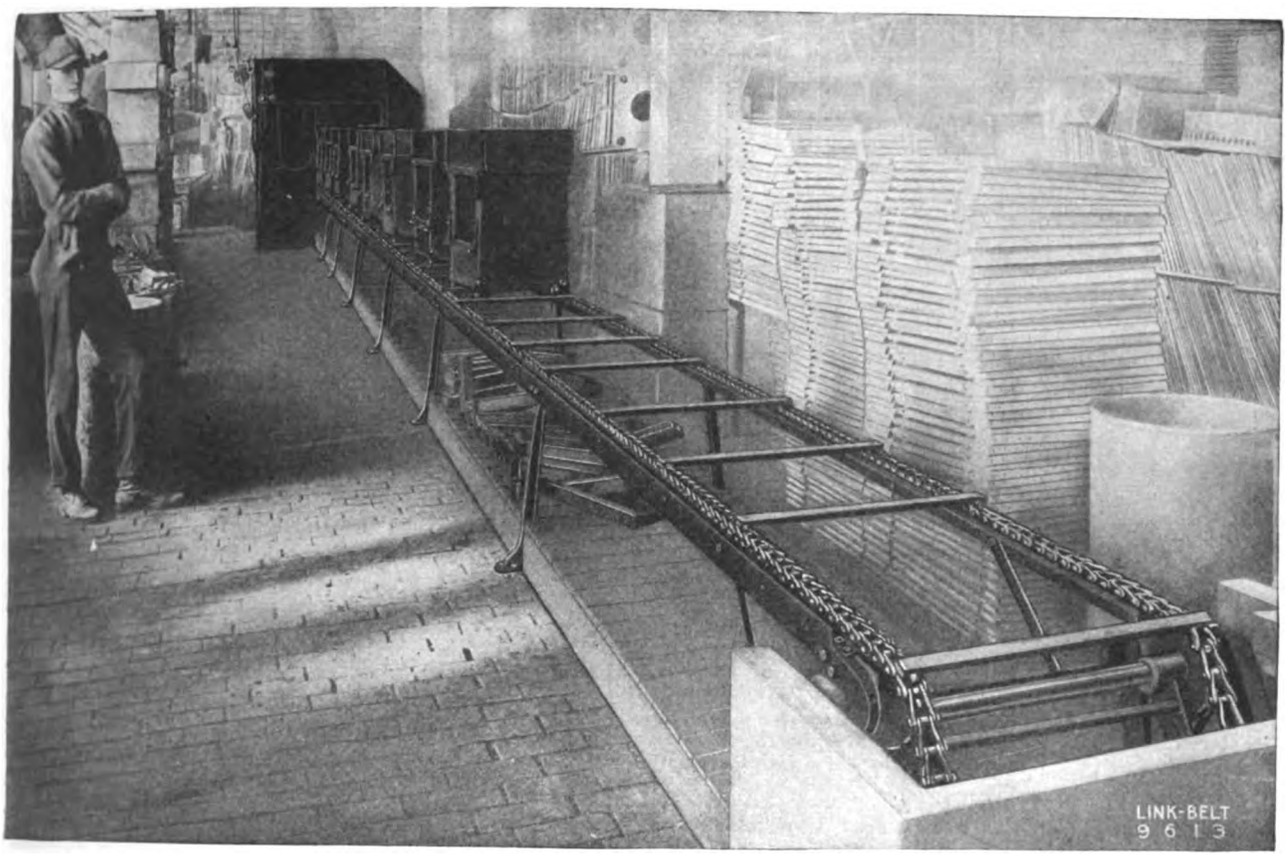
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TRADE MARK U.S.REG.

Toilet and Office Partitions

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"On two 1000-foot Link-Belt Conveyors our stoves are assembled, enameled, dried, crated, carried from one floor to another, and deposited on shipping platform or in warehouse.

"This cuts help in half and saves floor space.

"No handling of stoves by workmen—our Link-Belt Conveyors do it all."

AUTOMOBILES, Stoves, Batteries and many other things are produced quickly and at low cost by this method.

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Ask our experienced engineers to tell you more about it. Catalogs on request.

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Saves 50% of Handling Costs

These are the exact figures at this plant (name on request). In the handling of 175 lb. bundles of merchandise the ELEVEYOR has reduced the cost to 4.2 cents per bundle—this includes all fixed charges, such as depreciation, repairs, cost of charging and charging outfit and insurance. The hand labor method was 8.6 cents per bundle.

We have many more such examples of economies effected by the ELEVEYOR. Let us tell you about them.

Write for Catalog.

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KOEHRING HEAVY DUTY

Gasoline Crane

FOR the economical handling of coal, ashes, raw materials and machinery, the Koehring Gasoline Crane has the power, speed of operation, flexibility of control and traction mobility for the widest range of service in industrial plants. *Write for Crane Bulletin No. CE-16.*

Crane Capacities

No. 1—7 tons at 12 ft radius. ¾-cu. yd. clam-shell bucket, sand or gravel, at 28 ft. radius Boom lengths to suit conditions. 4-cylinder, 50 H.P. 5¼6 in. gasoline engine, 1025 R. P. M.

No. 2—12 tons at 12 ft. radius Handles following loads, sand or gravel, (clam-shell buckets): ¾-cu. yd. at 43 ft. radius; 1 cu. yd at 37 ft. radius; 1½ cu. yd. at 27 ft. radius. Boom lengths to suit conditions. 4-cyl., 70 H.P. 5¾x7 in. gasoline engine, 925 R. P. M



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Pavers—Mixers—Gasoline Cranes, Draglines and Shovels

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(*Continued from page 94*)

question, that they wash the windows and the lighting units at the same time—once a year.

Just recently I was called on to advise the management of an iron works on its lighting problem. I found the executives convinced that the lighting system in use was inadequate and they expected me to recommend an entire new installation, but I did not. I recommended instead that they wash the windows and repaint the walls and ceilings, also that they clean their lighting units and keep them clean. They had plenty of light but were not getting the benefit of it.

Many of the larger plants now maintain a regular maintenance schedule and employ men who devote their entire time to the care of the lighting system. They have become convinced that it is not economy to pay for something they do not get and that it is cheaper to keep their lighting units clean than it is to lower the efficiency of their employees and encourage spoilage and accidents.

It is of the utmost importance that the responsibility for proper maintenance of the lighting system be definitely assigned. Experience proves that unless there is a definite understanding on this point, the work is never properly cared for. A definite schedule should be outlined and followed regularly.

Any one who desires to be positive at all times that he is getting the proper illumination will do well to provide himself with a foot-candle meter. Such an instrument is small, compact, and inexpensive and will measure the illumination in a plant as accurately as a thermometer will measure the temperature.

Every plant has its individual lighting problems, however, and it is well to call in an illumination engineer from time to time. Any central station, lamp manufacturer, or reflector manufacturer will gladly send a man—and it won't cost you a cent.

THE sight of most of the nation's industrial blind, numbering about 15,000, could have been saved if the workers had been properly protected, it was asserted by J. E. Hannum of New York, research engineer of the Eye Sight Conservation Council of America, addressing an educational meeting of the Syracuse Safety Council and the Syracuse Safety Men's Club.

Danger of eye accidents in industrial plants he attributed to "needless neglect on the part of the management and of carelessness and indifference to danger on the part of workers." About one-tenth of the 2,000,000 annual industrial accidents in the United States, he said, result in injuries to the eyes.

"The safety activities through the plants of the United States Steel Corporation," continued Mr. Hannum, "have resulted in the reduction of eye accidents nearly sixty per cent. in the past ten years and 6,300 men have been saved from this type of injury.

"An analysis of sixty-five public utility records shows that the average is 13.6 per cent. for eye injuries. It is estimated that twenty per cent. of the non-fatal accidents occurring in foundries are eye accidents and that twenty-eight per cent. of these eye accidents result in the loss of one eye and ten per cent. in the loss of both eyes.

"In a recent inquiry sent out by the Eye Sight Conservation Council to over 350 safety engineers throughout the country, only eighty-one returns reported that their companies were furnishing goggles to workmen engaged upon hazardous occupations to their eyes."

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A $3,000 Pay Roll Saving
and
Cost Information *On Time*

SUCH have been two of the several advantages enjoyed by the Belden Manufacturing Company of Chicago, since they installed a McCaskey System of production control. This is just another instance of widespread McCaskey economies.

It is an interesting story. Read it in the words of Mr. R. F. Johnstone, General Superintendent.

"Under our system of production control, we made a copy of each factory order for each department concerned, and one master copy for the production control desk. Each time a delivery is made by a department, a delivery ticket is sent to the control desk.

No More Lost Tickets

"Up to 3 years ago, 3 girls were kept busy posting the items from these delivery tickets onto the back of the master copies of the factory orders. But many tickets went astray—sometimes 2000 a month—although a man was constantly chasing them. We therefore had great difficulty in supplying our cost department with accurate monthly departmental production figures.

Eliminates 2 Clerks

"By installing 3 McCaskey Cabinets and changing our delivery tickets a little, we eliminated all confusion and inaccuracies. One girl and the McCaskey Cabinets now handle all production records—although the volume of work is greater. This means a direct pay roll saving of at least $3000 a year.

"Factory orders are made out as before; but instead of posting the delivery items, we now file the tickets in the McCaskey—all tickets for the same job together. These tickets now show all deliveries—previous, present, total and balance to come—and the McCaskeys make this information almost instantly accessible. The production control desk always knows whether all tickets have come through.

"Even more important than the $3000 a year pay roll saving are the system's accuracy and availability. We can now give our cost department accurate information each month—and on time."

In Your Plant

Scores of manufacturers of every type are proving McCaskey economies day after day—economies in cost records, tool records, inventories, machine control, and many other administrative functions. We will be glad to show you how these savings can be made in your plant. Write for booklet today.

THE McCASKEY REGISTER CO.

McCASKEY ONE WRITING SYSTEMS

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Every Man for Himself



WASHING is an act for the individual without the usual element of team play. Each man washes his own face and hands and therefore should have his own water. Common troughs, sinks and similar devices should be a thing of the past.

MEECO Washbowls are in 5,000 factories, representing 200 industries. The general acceptance of these washbowls by leading manufacturers is proof of their superiority.

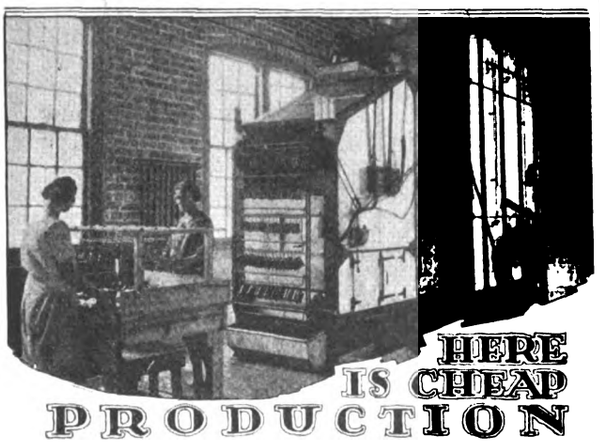
They are adaptable to small or large space. Their construction offers greatest economy in conserving water. The porcelain enameled bowls—the sturdy cast iron frame—combine sanitation and durability. You can order these bowls in batteries of any number to fit your space.

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Lockers, Partitions *Shelving, Boxes*
Chairs and Stools *Drinking Fountains*

METAL MEECO PRODUCTS

MFG. EQUIPMENT & ENGINEERING CO.
FRAMINGHAM, MASS.



HERE IS CHEAP PRODUCTION

Maehler *Multiple-Pass Conveyor Ovens, designed for quantity production of small parts with low labor, power and fuel costs.**

The loading and unloading requires but two girl operators. This conveyor automatically dips and bakes 1400 lbs. of castings per hour, 27,000 pieces per eight-hour day at a fuel cost of $2.00.

The results are typical of our cost reduction methods.

A Maehler *Multiple Pass** Oven fitted to your product will result in an immediate and decided operating cost saving. We will be glad to advise you.

These ovens are mechanically perfect, of high grade workmanship, and give uninterrupted service.

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The PAUL MAEHLER COMPANY
INDUSTRIAL OVEN BUILDERS
2218 W. LAKE ST. CHICAGO, ILLINOIS

Materials Handling Forum

(*Continued from page* 39)

During the inspection of plants and in conversation with various materials handling manufacturers representatives, the subject of trial installations has been mentioned quite frequently.

It is true that only standard equipment such as lift trucks, portable elevators, continuous pilers, electric hoists, chain hoists, storage battery trucks and tractors, as well as gasoline trucks and tractors come under this heading, but with such a large proportion of the field represented, we feel a general discussion by our readers will materially assist both them and the manufacturers to formulate a definite practice in regard to trial installations.

From personal observation there is considerable in favor of and against this trial installation practice; frequently the manufacturer gains by such free installation and again loses the sale and is burdened with the expense of making such installation. This, of course, must all be figured in the overhead cost.

Some groups of manufacturers have banded together, from time to time, definitely deciding not to make any more trial installations, but in the stress of obtaining an order, and when satisfied that the user can benefit by purchasing the equipment, these companies have made such installations by accepting a written order from the customer with the understanding that payment is to be made in thirty days, and if not satisfactory, the equipment may be returned. Even with this arrangement they are sometimes obliged to accept the return of the equipment.

We do not wish to say what should be done or to make arbitrary rules, but as this practice is one which is affecting the growth of the materials handling industry, we feel obliged to mention it here so as to bring it direct to the readers' and manufacturers' attention. We will be pleased to hear from both.

* * *

Question No. 1.

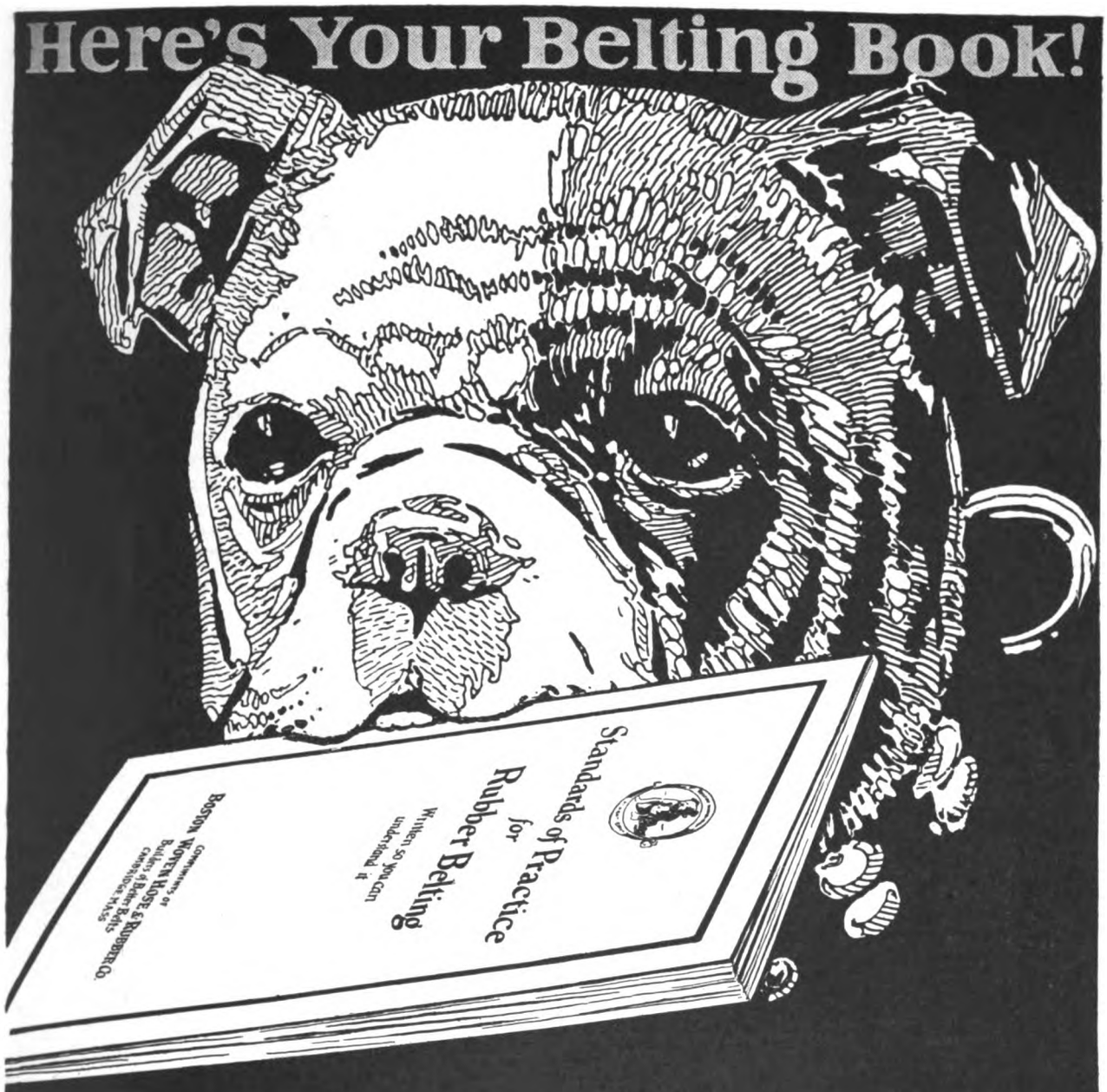
"Do you know where we can get a satisfactory conveyor which will convey bulk acid phosphate from box cars, about 40 feet or preferably farther, to out dumping pit? We have a belt conveyor connected to elevating machinery (bucket and chain) but this has never been satisfactory and the acid phosphate is usually a little wet and "gums up" the belt.

"We have been told by manufacturers that there is no satisfactory method to unload bulk acid phosphate other than "a nigger and a wheelbarrow" but labor is becoming rather scarce and we would like to replace some of it with a conveyor."

The handling of acid phosphate has presented a problem to many manufacturers. It is true that varying conditions, and the layout of the plant has much to do with the satisfactory handling of this material by mechanical methods. As there is such a cry, as included in the last paragraph of Question 1, coming from the Southern part of the United States where labor is supposed to be plenteous, we would like our readers to furnish us with additional information from their experience as to how this material has been handled successfully by materials handling equipment.

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Here's Your Belting Book!



A Manual of Belting Application written so you can understand it. Every buyer and user of belting will appreciate this readable book. *Send for your copy!*

BOSTON WOVEN HOSE & RUBBER CO., *Cambridge, Mass.*

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The Daily Control Sheet For Executives

A Simple Method, Involving No Excessive Clerical Work

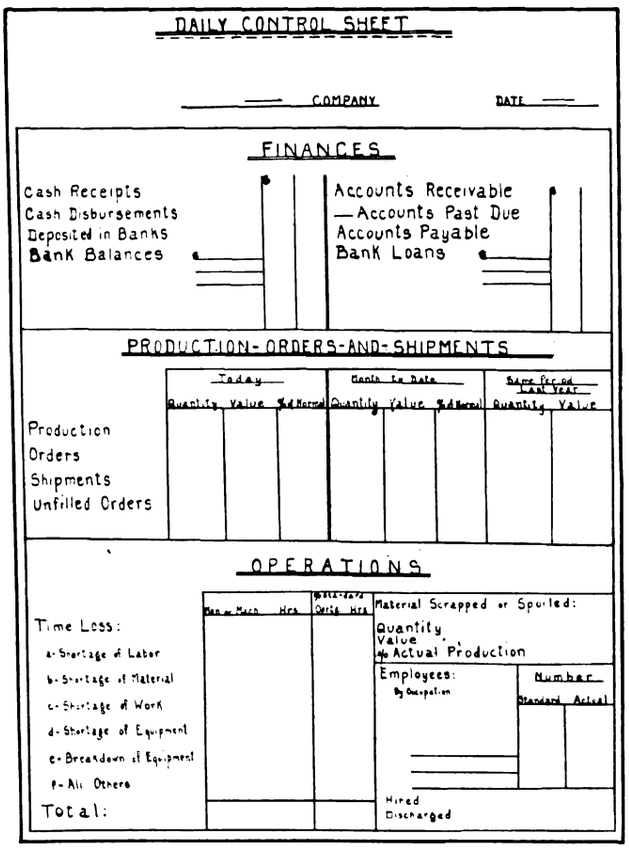
By Arthur Lazarus

THE purpose of the Daily Control Sheet is to give an executive, day by day, the significant facts concerning his business. Such facts must necessarily be few, summarized in form, and in some cases approximated rather than a hundred per cent. correct. If the picture presented to the executive is satisfactory, the report is noted and filed. If the situation, however, is disturbing, the executive will call for additional information on specific items so that he may readily change plans or policies.

The Daily Control Sheet will naturally vary in form with the requirements of particular establishments, hence it is to be understood clearly that the form presented is merely suggested and that it is expected that each concern will adapt the same to meet its own needs.

The Daily Control Sheet attempts to unite in a single form the facts concerning Finances, Orders and Shipments, Production and Operations.

The information given of a financial nature is fairly well standardized and requires perhaps little comment. The blank calls for information concerning cash receipts, cash disbursements, bank deposits and balances, bank loans, accounts receivable, accounts past due, and the accounts payable. The accounts past due are given so that the executive may act quickly to save accounts which appear doubtful.



A simple form, whereby the essential figures can be presented daily for executive study.

The Production Orders and Shipments section is designed to show the relation between orders received, goods shipped and goods produced. It is expected that the executive will establish a norm, standard, or budget of what ought to be produced and what orders should be received and shipped daily.

In addition to this daily record, cumulative totals for these items are shown, which cumulative totals it is advisable to compare with the corresponding period of the previous year.

The information given under Operations is designed to give the executive some idea of the time lost in operation, and of the material scrapped or spoiled. If these items are unduly large, the executive will investigate the causes and suggest or work out corrective measures. There is also given the number of employes by occupation, both actual and in comparison with the standard, so that the executive may be able to note the effect of a rise or fall in production upon the number and character of the men actually employed. The number of men hired and discharged is provided for. If the number discharged is excessive, the manufacturer will probably call in his personnel man for an explanation.

It is expected that this Daily Control Sheet will involve no new administrative machinery. The various reports will be sent in to the president's secretary or assistant, who can quickly assemble the same on the regular form for submission to the chief executive. The entire operation of so assembling the facts should not take more than ten or fifteen minutes. The information relating to finances will be supplied by the general ledger accountant, cashier and credit man. The sales manager and shipping clerk will be responsible for the information concerning orders and shipments, the production manager, factory accountant and personnel man for the information relating to operations and production.

The Daily Control Sheet is intended to supplement, not to supersede, the weekly analysis of the payroll, the weekly statements of purchases and of delinquent deliveries, of raw, processed and finished material on hand, and the monthly statement of assets and liabilities, of earnings, and monthly analysis of sales, of material consumed, of factory burden, etc., and of cost variations.

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PERKINS PIVOTED BUCKET CARRIER

The Most Practical Type *of* Chain Conveyor *for* Handling Coal and Ashes

Power house requirements are just as vital as the requirements in any other department of your plant. The distribution of coal into bunkers and removal of ashes requires efficient machinery such as will reduce costs.

Modernization does not imply rebuilding your plant. Efficient coal and ashes handling equipment can be installed without jeopardizing production. Many power plants have been modernized the Webster way and have paid for themselves out of the savings effected.

Does your plant need modernizing? Is your coal handled efficiently? Does the removal of ashes give you concern? If so, a Perkins Pivoted Bucket Carrier or any of the power plant equipment listed below will cut down costs and make your plant efficient.

A Webster Engineer will be glad to confer with you and advise suitable equipment to reduce costs. Almost a half century stands behind Webster products and this background of experience is your guarantee.

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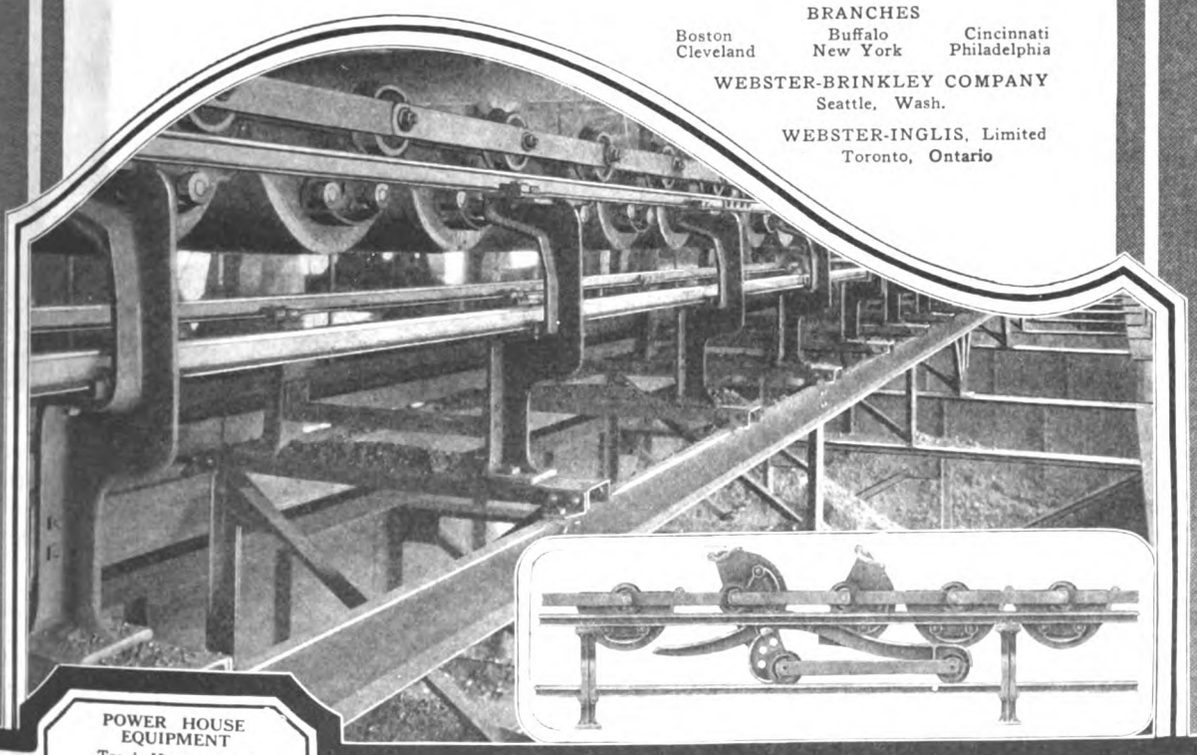
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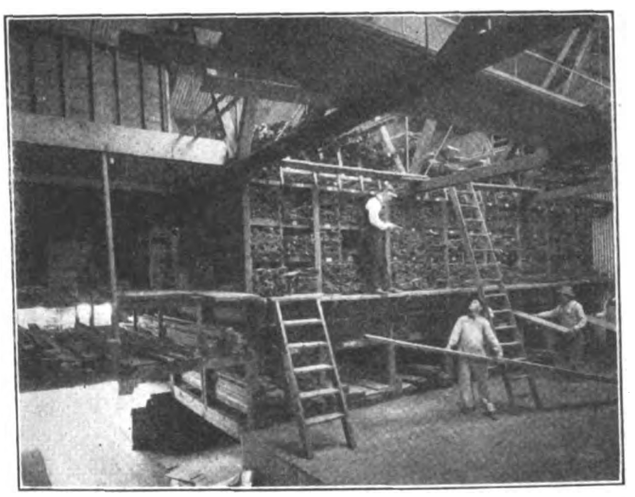
Finding the Labor Cost of Wood Parts

By R. E. Shallberg

A LARGE percentage of the firms manufacturing wood parts pay for the labor expended in the mill or wood department by the hourly rate, or on a combined piece and hourly basis.

The writer, while working several years ago for an automobile body manufacturer, was forced to cut considerable of his department force because of general business conditions. It naturally became necessary to figure various costs by a shorter, yet a satisfactory method.

This method proved very simple and yet satisfactory, with very little time or effort necessary to compute. The board footage of lumber produced in the wood department was determined from the orders placed and finished



Very few woodworking concerns have their labor on a piece-work basis.

in that department. The total amount of direct labor expended in the wood department was easily obtained from the weekly or monthly payroll distribution. The total cost of the direct wood-room labor was divided by the board footage produced and a cost per board foot resulted.

This figure, accumulated over a period of several months, was not of course sufficiently accurate. But after six months and then a year, a cost per board foot was obtained which varied very little from year to year.

Year.	*Average rate Paid per hour.*	*No. board feet produced*	*Amount expended for direct labor.*	*Cost per board foot.*
1921	.48	449,618.15	14,845.19	.0330
1922	.42½	822,981.92	24,190.69	.0293
1923	.44½	598,847.69	19,590.98	.0327

This labor cost per board foot could easily be applied to any body, knowing the board footage it contained.

For example:

Roadster body (specification rough size) 150 ft. @ .0327=4.91
Touring " (specification rough size) 170 ft. @ .0327=5.56

The board footage method of determining costs can be applied to the wood departments of various concerns with good results. Where the final wood product, however, is not assembled into large assemblies, or where separate costs are necessary because of the obvious difference in the cost of manufacture, this method could not be applied with accuracy.

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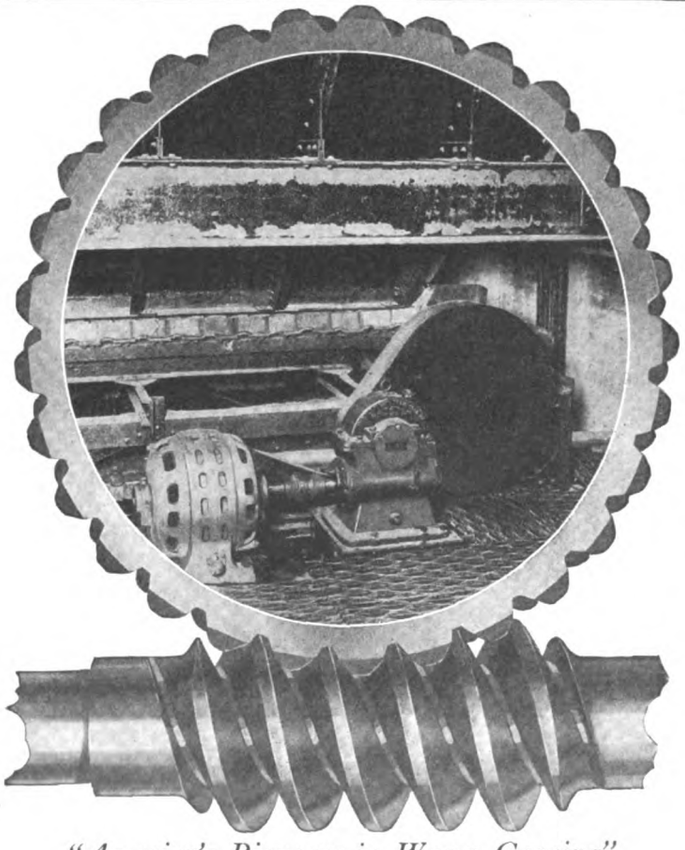
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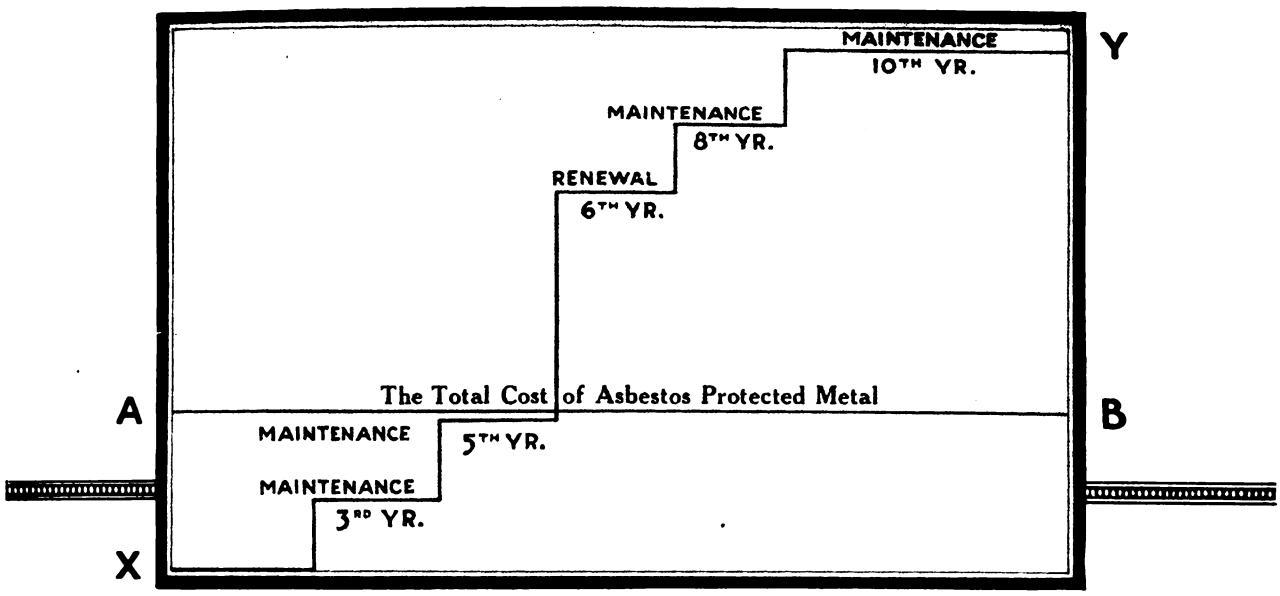
The illustration shows a single type—Cleveland Worm Gear Speed Reduction Unit driving a Coal Conveyor in a manufacturing plant—Motor 5 H.P. at 1200 R.P.M. Speed Reduction 40 to 1.

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Here's a little chart that has a world of meaning for anyone who specifies or purchases roofing and siding materials for industrial buildings.

The line starting at (A) represents the cost (including erection) of Robertson Asbestos Protected Metal Roofing and Siding over a ten-year period. Note that it's a *straight* line—and a *horizontal* line. That's because the first cost of Asbestos Protected Metal (APM) is its *only* cost. Since it was put on the market in 1908, APM has proved its ability to give years of service under the most adverse conditions without requiring repairs or replacement. More than that—APM never requires painting. It eliminates upkeep expense. Isn't that real economy?

Now consider the line starting at (X). This irregular and steadily ascending line represents the comparative cost of ordinary unprotected metal sheeting over a ten-year period. Note how the cost mounts every two or three years as painting and repairs become necessary to preserve the life and usefulness of an unprotected metal roof.

In about the middle of the ten-year period complete replacement becomes necessary. The result is that in the end of the period an unprotected metal roof has cost twice as much as a roof of APM.

And bear in mind that this chart is not based on guess-work or unsupported facts of any kind. It represents a composite of the actual experience of prominent concerns in many industrial fields. It pictures graphically economies which you yourself can make through the use of Asbestos Protected Metal instead of unprotected metal or other comparatively short-lived roofing materials.

Then, too, when you use APM on your plant buildings you effect further savings in time, labor and materials through the complete engineering and erection service which goes with Robertson Building Products. You should have complete information on this unique and tremendously valuable service. Get in touch with us.

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This "cut-away" view of Asbestos Protected Metal shows how the steel sheet is completely sealed in three impervious protective coatings (1) Asphalt (2) Asbestos felt and (3) Waterproofing. The result is a strong, substantial and permanent building material that is rust, weather and corrosion-proof and requires neither painting nor repairs.

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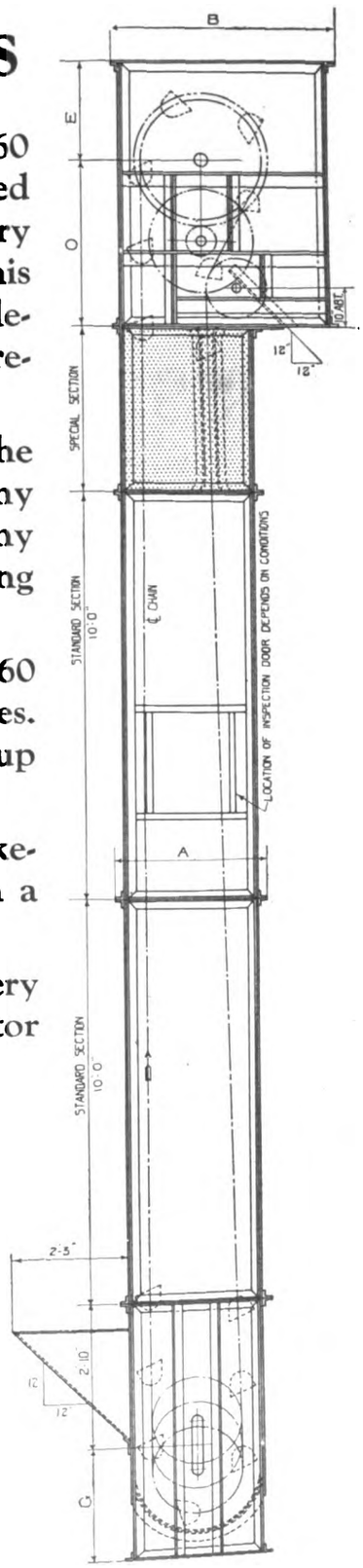
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The shop engineering for every size of elevators up to 60 feet on centers has been reduced to blueprints and tables. It is only necessary to add the special section to make up the required lift.

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That is why we are able to offer this unusual delivery date on Rex Economy Elevators. If you need an elevator write today.

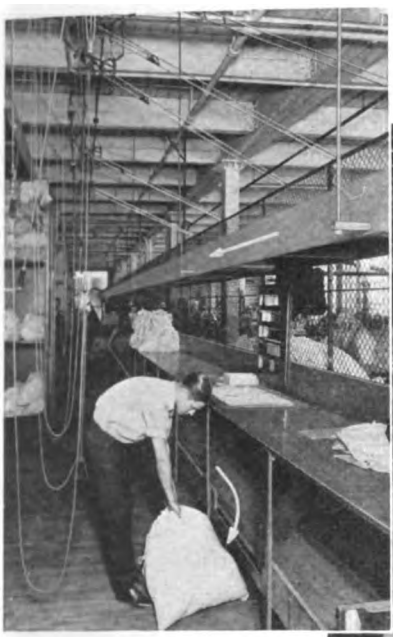


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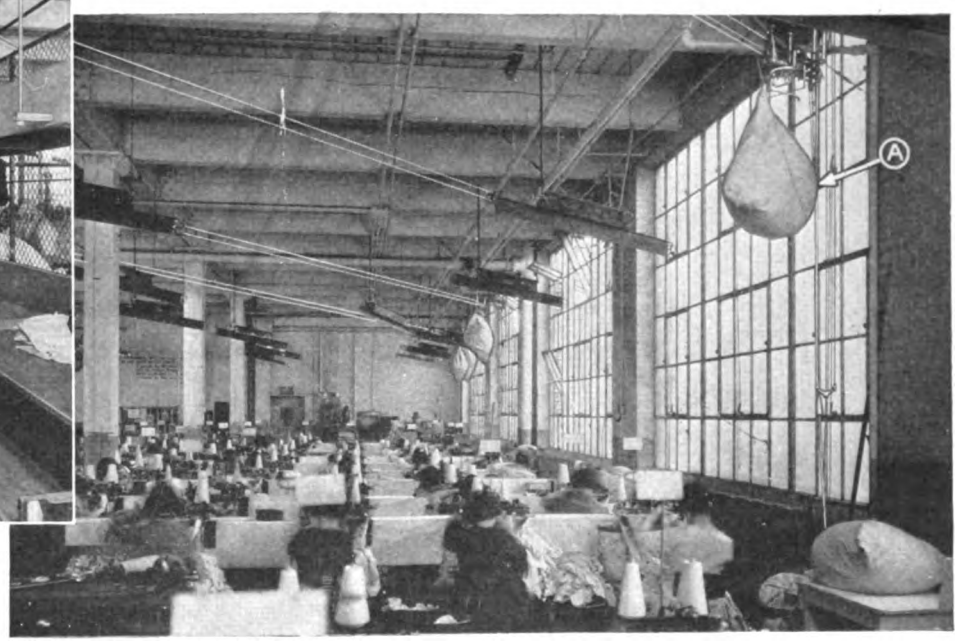
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Picture above shows central stock room from which Lamson Wire Line Conveyors radiate to the different groups of machines.

Picture below shows manufacturing department equipped with the new Lamson stock control system. The bag of material at (A) is ready for instant use by any worker requiring new stock.



This new Lamson stock control plan boosts production and cuts inventory

More production per worker, and a greatly reduced inventory of stock in process are the outstanding advantages of this new Lamson plan of stock control.

With the system pictured above, in the plant of a large manufacturer of knit goods, a moderate supply of raw stock is kept in a central department. From here, Lamson Wire Line Conveyors, hung close to the ceiling, radiate to the different groups of machines.

A bag of raw stock is always kept at each machine-group station. A worker requiring new stock goes to the nearest station and lowers this bag of material by a pull on a convenient handle. Then, after loading the bag of finished goods on the conveyor, a pull on another handle sends it spinning down the overhead wire track to the stock room.

Here, the finished goods are removed and sent by conveyor to the next operation, while another bag of raw stock is sent out to the department station, ready for the next worker who requires it.

Workers' time is more productive, as they do not leave their machines to walk to a distant stock room window every time they need new stock. Nor are messengers required, with their inevitable gossipping and delays.

A surprisingly small amount of stock will keep a large department fully supplied. Stock in process is thus materially reduced.

In any plant where light materials of moderate size are handled, this new Lamson stock control system pays generous dividends on its very moderate cost.

May we show you how you, too, can save money through using this progressive plan?

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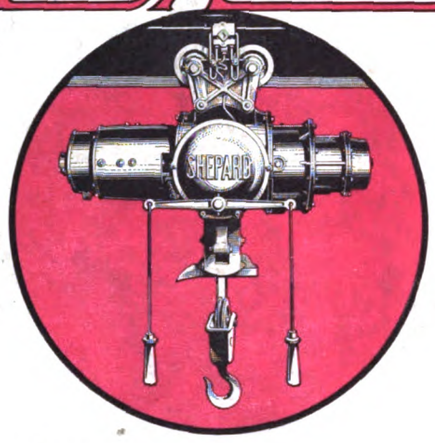
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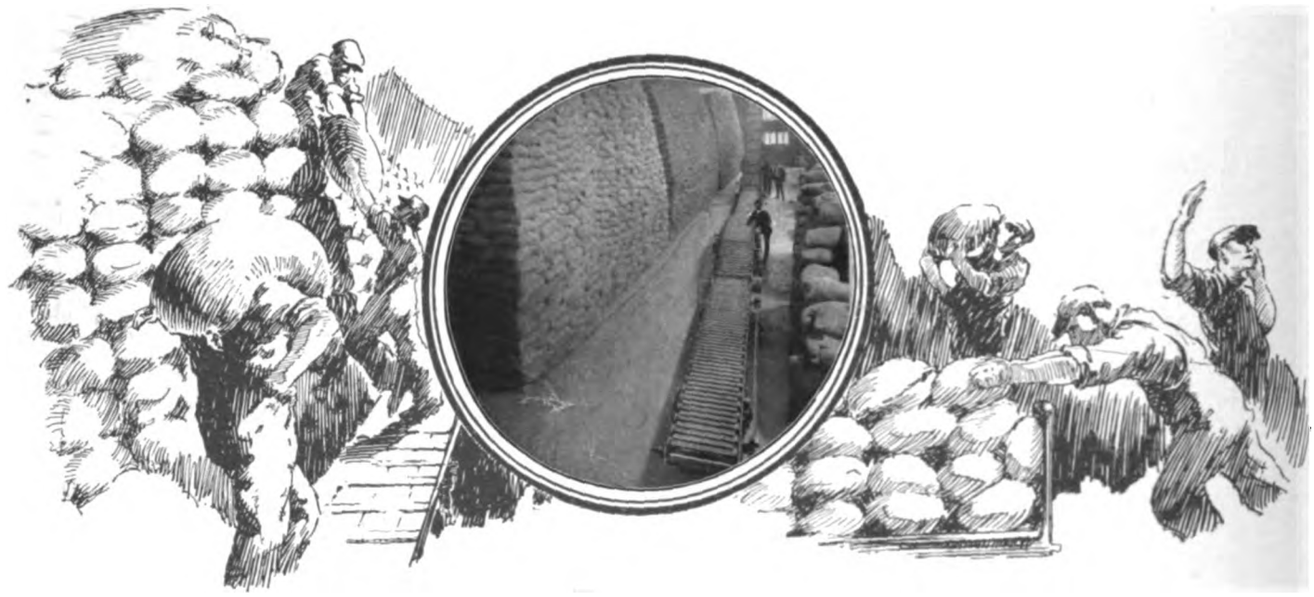
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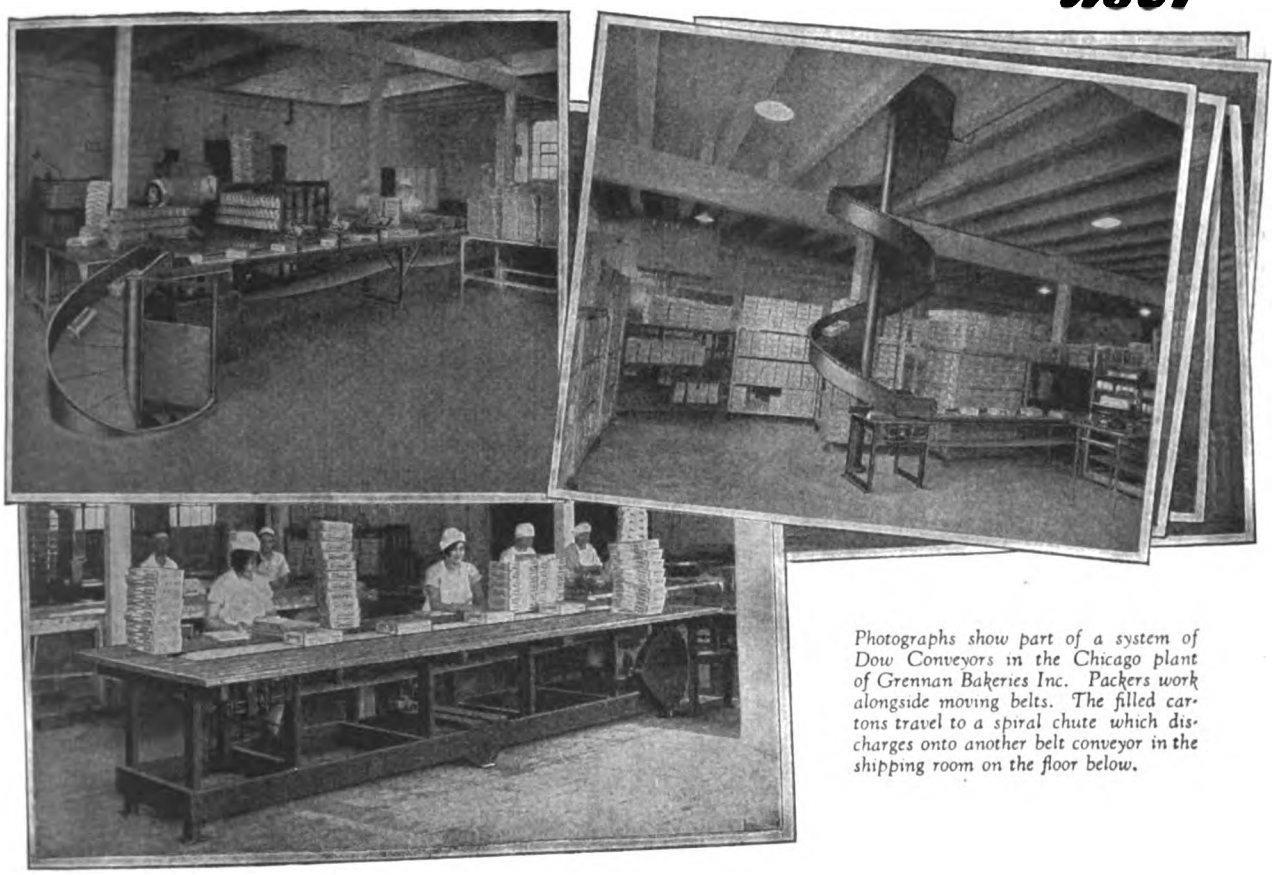
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GRENNAN BAKERIES - another user



Photographs show part of a system of Dow Conveyors in the Chicago plant of Grennan Bakeries Inc. Packers work alongside moving belts. The filled cartons travel to a spiral chute which discharges onto another belt conveyor in the shipping room on the floor below.



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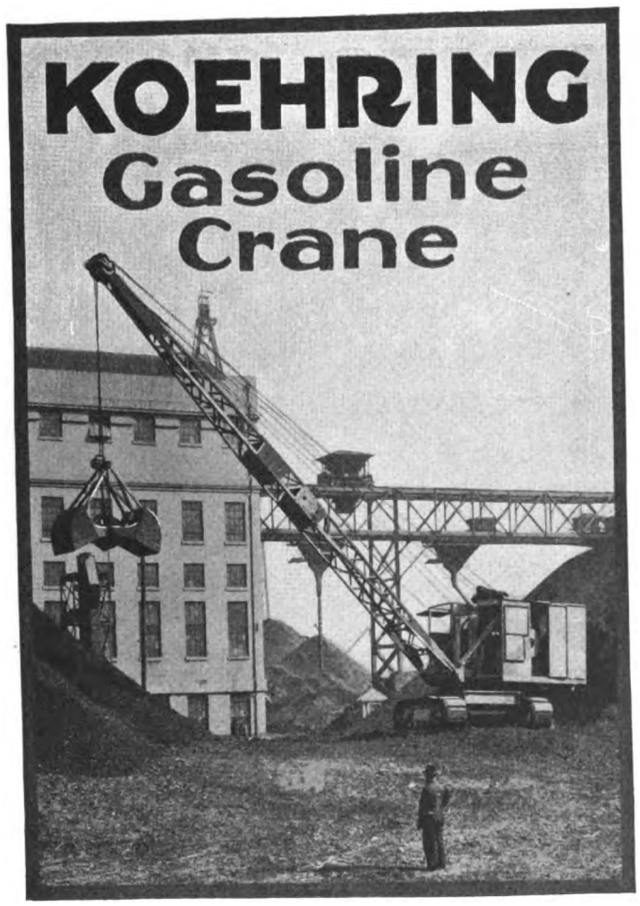
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The Publisher's Column

Income and *Outgo* - Success

Income and *Outgo* - Failure

Sometimes we are surprised to read of the big estates left by people who, we know, have had but moderate incomes.

In such cases you will find that thrift—which is another name for good management—has consistently kept **outgo** smaller than **income.**

This is the big secret of success, in business and industry, as well as in personal affairs. It should be printed as a slogan and hung over the desk of every managing executive, replacing the far less potent formula of "Do it now."

Sometimes the keeping of **outgo** less than **income** means "Don't do it now—stop and think of a better way of doing it."

Secretary Hoover reports that by taking time to think of better ways of doing things, American industry is saving six hundred million dollars per year through the elimination of wastes. This means that outgo is being pared down—that superfluous fat is being removed from industry to the betterment of its health.

Every pound of superfluous fat that is fried out of outgo means an additional pound of good, healthy profits. A big income or a big volume of sales cannot be called healthful until you examine the all-important outgo.

The mission of INDUSTRY ILLUSTRATED and other worth while business publications is to point out to you ways and means of keeping **outgo** smaller than **income.**

Industry Illustrated

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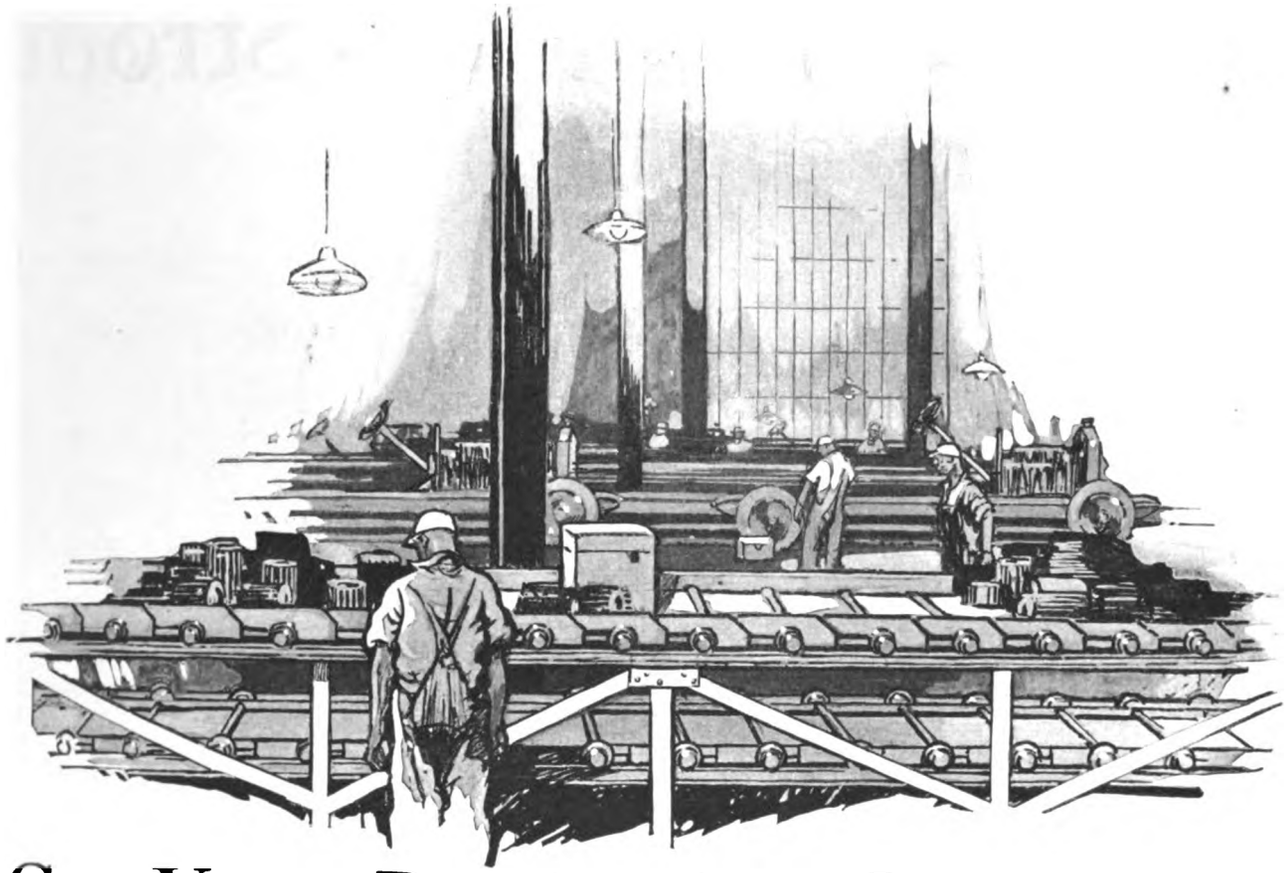
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Back of every Brownhoist Conveyor are forty years of experience in the design and construction of material handling equipment. Our Engineering Staff will gladly confer with you on your conveying or material handling problems. Their suggestions have resulted in marked economies in plants of every sort, the world over.



Here's the secret of Brownhoist Conveyor stamina—

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The link illustrated is of drop forged I-Beam type construction.

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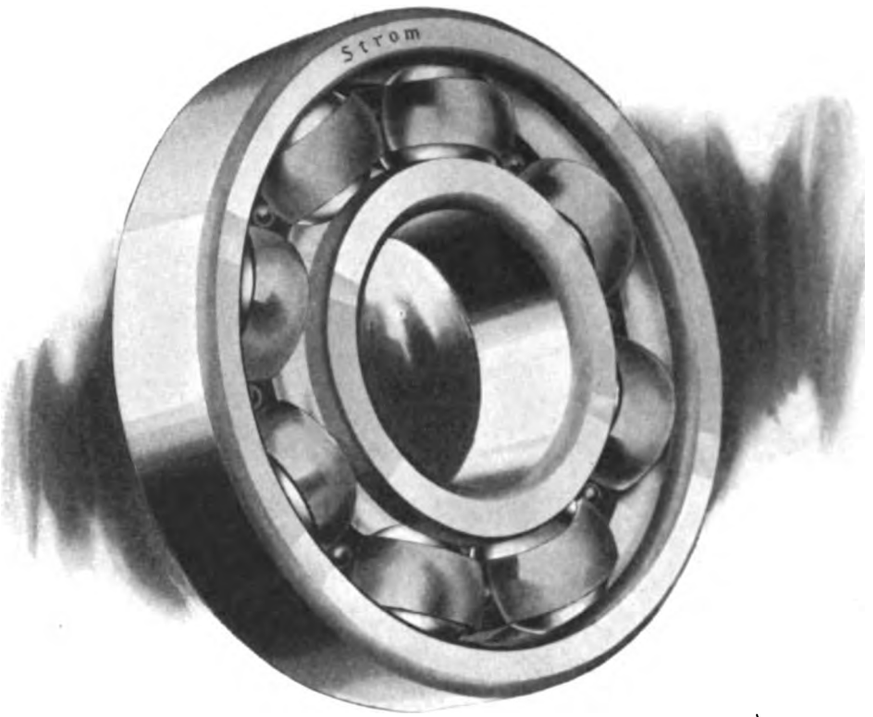
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1—The Barber-Greene Coal Loader of the Malcomson Company with its nose buried in a pile of coal.

2—A close up of a Barber-Greene Coal Feeder and Conveyor working from beneath a hopper-bottomed car.





3—A Barber-Greene Conveyor backed into, and ready to fill, a bin.

4—The Malcomson Company's Coal Loader taking good care of its job. This machine is used for loading practically all kinds and sizes of coal and coke.

Even if hand labor showed the same low costs

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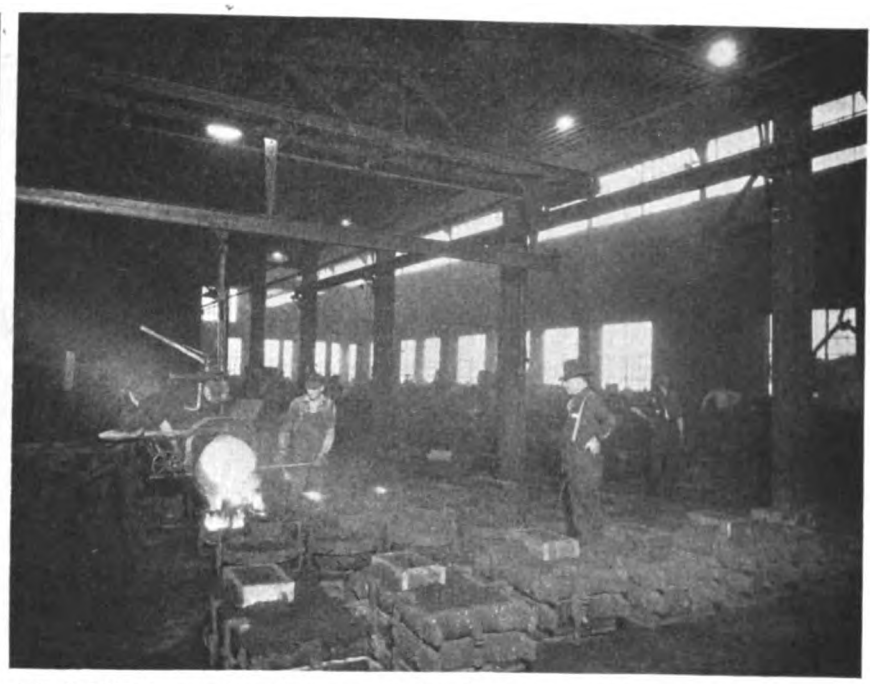
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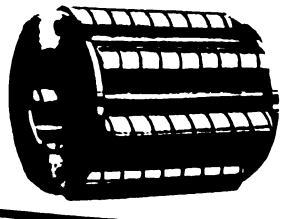
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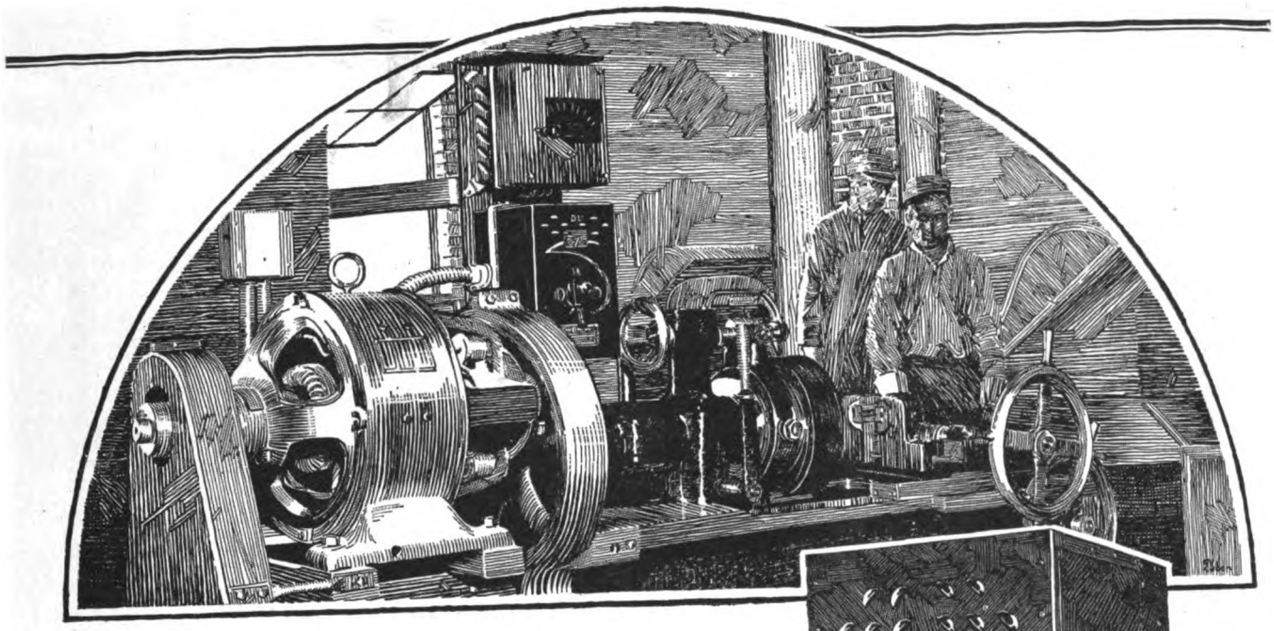
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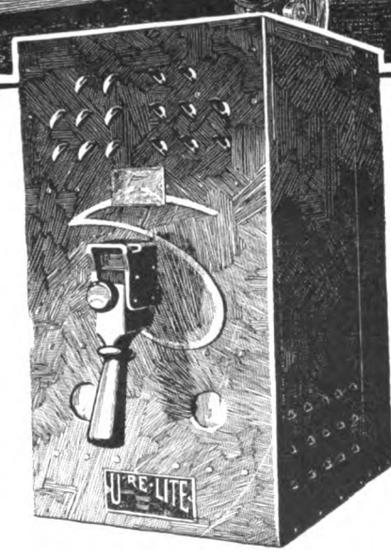
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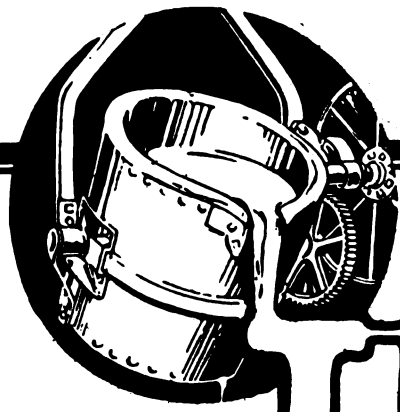
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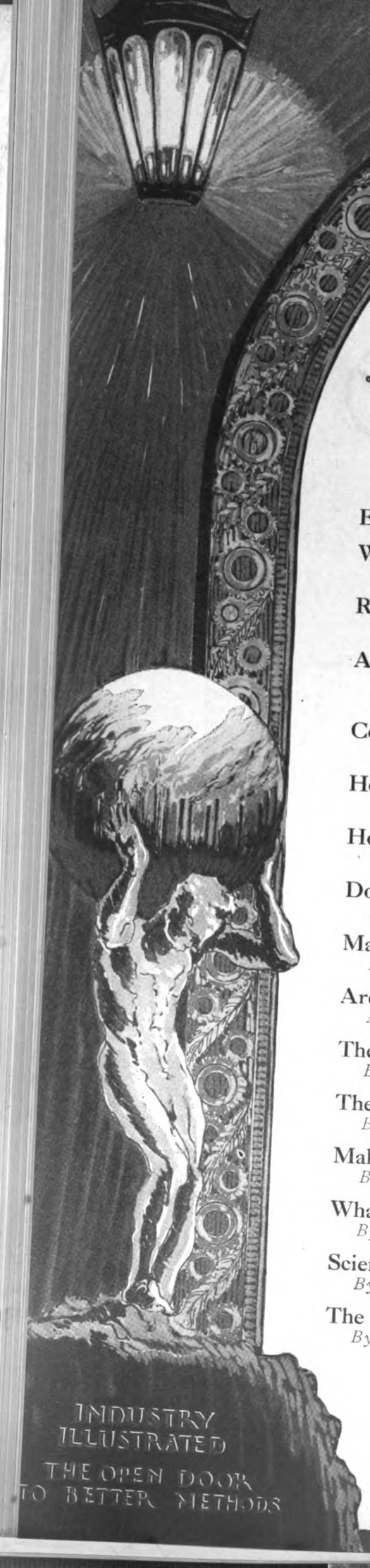
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FEBRUARY, 1925

Industry Illustrated

The Pictorial Presentation of Practical Management

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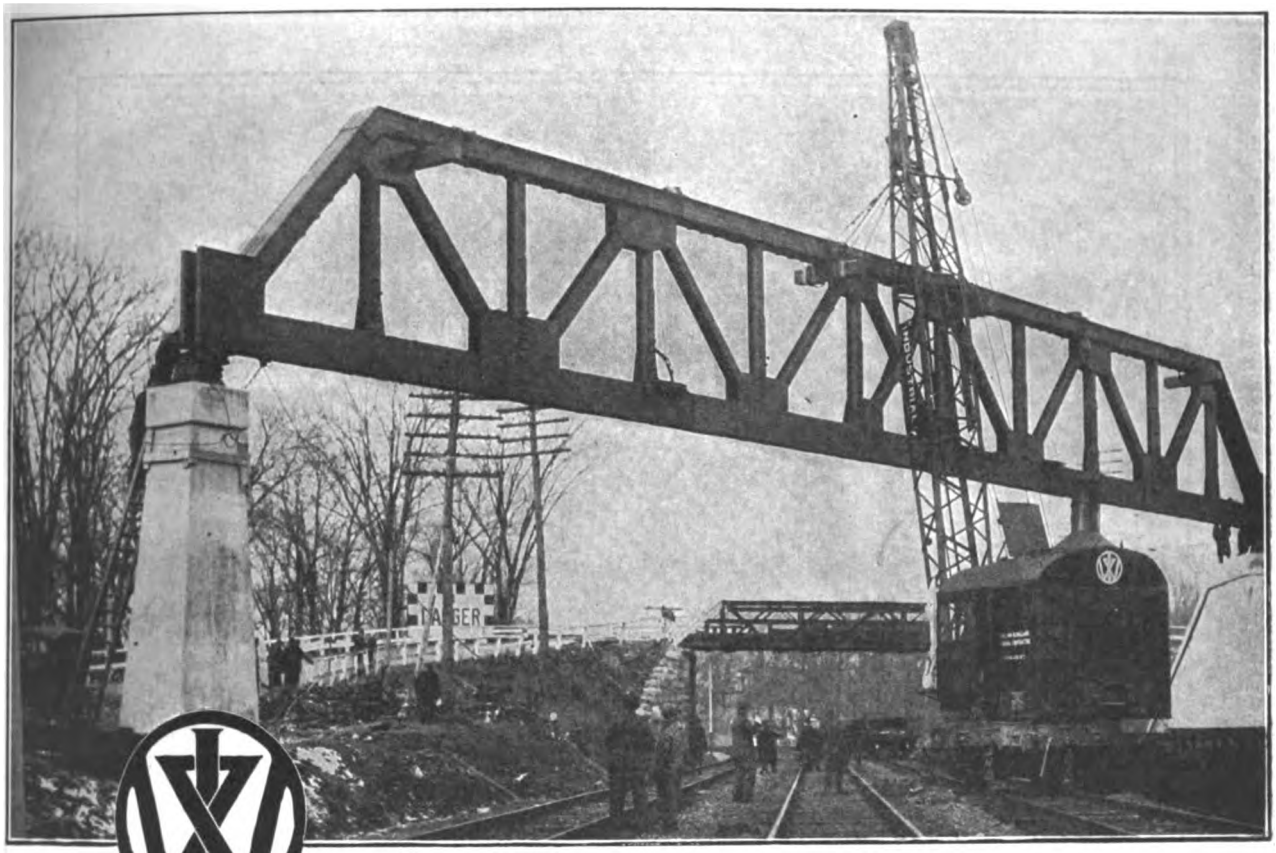
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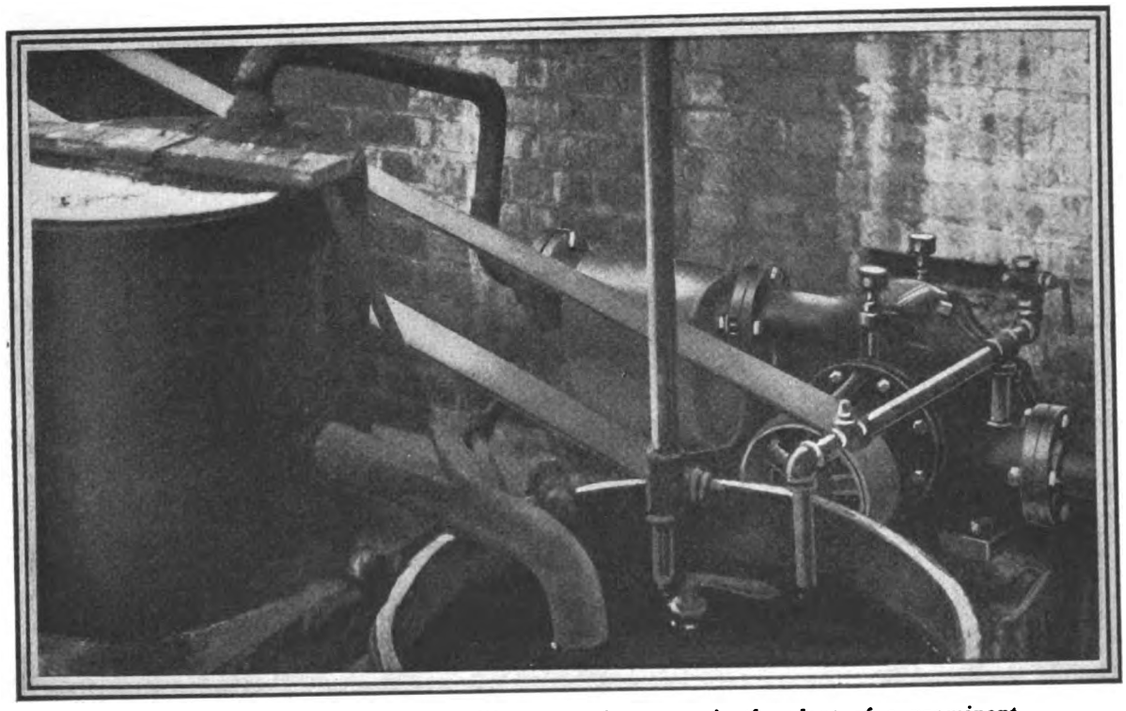
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"—stand up where others fail"

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Industry Illustrated

The Pictorial Presentation of Practical Management

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES, MATTHEW W. POTTS } *Associate Editors*

ADOLF SCHILDKRAUT, *Art Director*

Editorial

Is "Common Labor" Disappearing?

THE recent announcement that a certain large manufacturer had decided to discontinue the making of horse shoes brought forth a good deal of comment—serious and frivolous—in the daily press. The casual observer mourned "the passing of the horse"—until someone thought to delve into statistics: when it was found that, far from being relegated to the scrap heap, the horse continues to serve mankind in increasing numbers. The motor truck, in actual fact, has created new facilities and taken over only the heavier burdens, while statistics show that there has been no marked falling off in the demand for draft horses.

Human labor, however, is different. The horse has only his strength; but the human laborer has a brain. And, when machines take over the work formerly done by men, those men can be taught to operate the machines.

We know that, for many years, labor bitterly opposed the introduction of each new labor saving machine, on the score that these machines were "taking the bread from the mouths of honest men." What they failed to see was that these machines were slowly but surely revolutionizing the very meaning of the word "labor." A few decades ago, such an immigration policy as we have recently adopted would have meant industrial chaos: we *had* to have an immense influx of "common labor" each year, in order to get our foundations dug; to get coal shovelled; to get done the thousands of "common labor" jobs for which we paid men a dollar for ten hours' work.

More and more, today, we dig ditches by machinery; we dig foundations, transship freight, lift heavy loads, stoke our furnaces, harvest our crops by machinery. And, more and more, "labor" is being transformed from back-breaking, strength-sapping *work*, to mere attendance upon the iron slaves which do the work faster and better.

The world has seen many civilizations rise, flourish and perish. But each of these earlier social structures was built upon human labor, the practical enslavement of the many for the benefit of the few. Education, culture, leisure always hitherto, these were for the few and at the expense of the mass of humanity.

The work of the world has to be got through, that we may live. The drudgery, the hard work which was once performed by slaves, then by "common labor" this, too, must be got through; but by machinery, not by man-power. Common labor, as we know it, is passing. And the time is not far distant, when men may look back and wonder that such tasks ever were performed by men.

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What Is the Measure

Why the United States Cannot Afford to Main

THE big man, in the chart immediately at the right, is the American industrial worker—not merely the common laborer, but a composite of unskilled, semi-skilled, and skilled labor in American factories. His size is based, not upon skill or physical dimensions, but upon his earnings as compared with the earnings of comparable composites in the principal countries of Europe.

This chart in itself tells graphically a story which we cannot afford to ignore. At the same time in connection with the immigration curve, below, it helps to make clear the reason for our new immigration policy. Obviously, if a man is working for from ninety-six cents to $2.28 a day, he will cast longing eyes toward the land where the same (and often less) effort will bring him $5.60 a day.

In those "good old days" when common labor was ten cents an hour, and worked hard for ten hours a day; when horse cars were rapid transit, a shave cost ten cents, movies and radio were unknown—in *those* days this country *needed* the great influx of workers from abroad. There was work aplenty, and industry was growing at an ever-increasing rate. More and more, too, American labor was raising its standards both of pay and of work—so that certain kinds of work began to be considered fit only for the cheap foreign laborer.

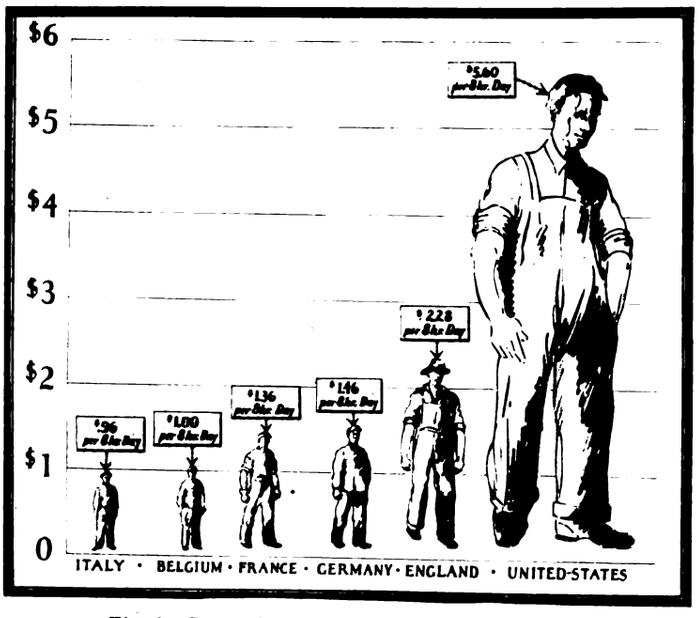
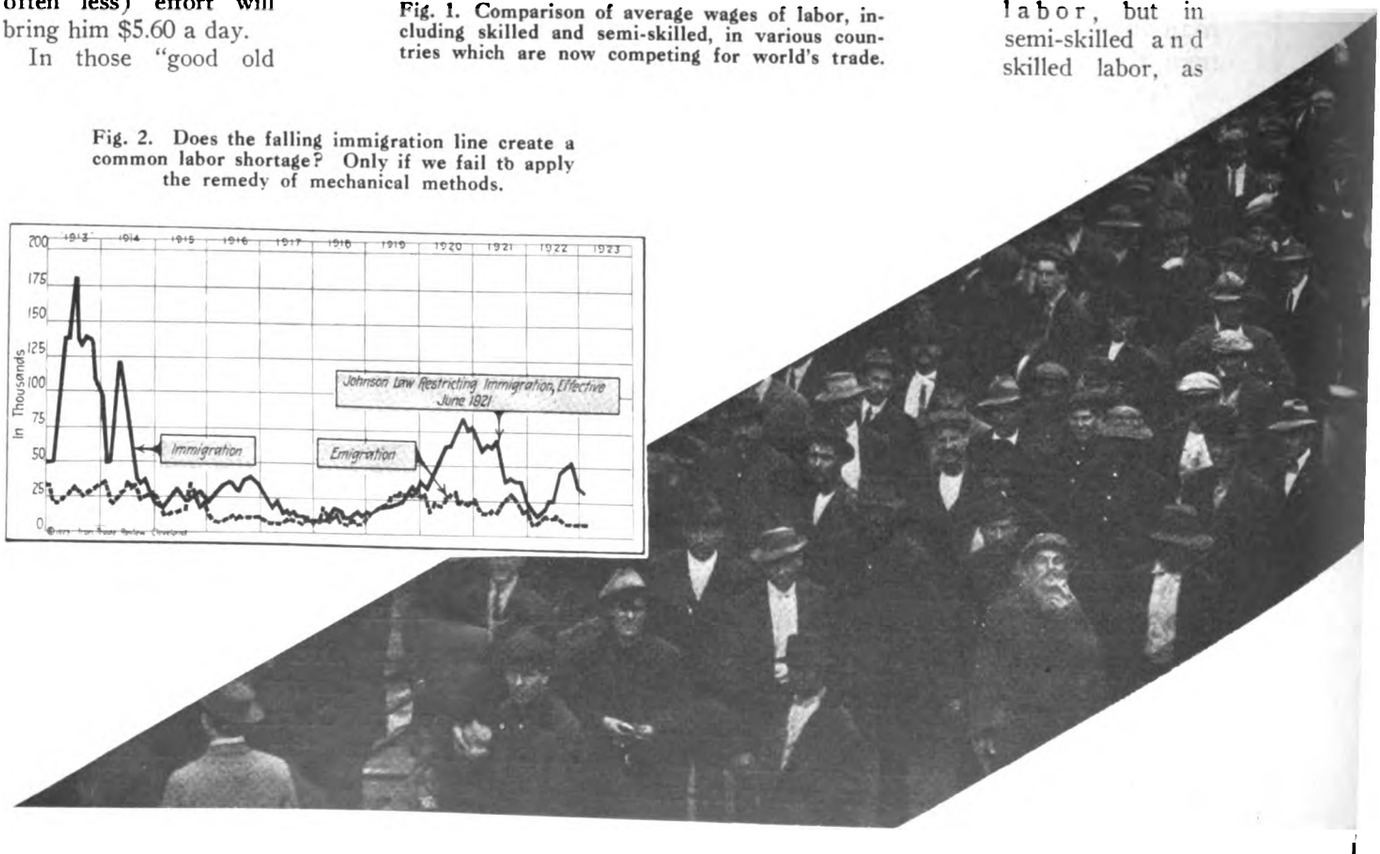


Fig. 1. Comparison of average wages of labor, including skilled and semi-skilled, in various countries which are now competing for world's trade.

Even without the world war, this condition could not have continued indefinitely. But the war brought about a sudden crisis; immigration stopped almost completely; production, meanwhile, had to be immensely increased. All the tasks of "common labor" had still to be performed, even while our reservoir of common labor was depleted. Moreover, with our own entry into the war, we had to overcome a deficiency not only in common labor, but in semi-skilled and skilled labor, as

Fig. 2. Does the falling immigration line create a common labor shortage? Only if we fail to apply the remedy of mechanical methods.



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of Labor's Value?

tain the Open Door for Foreign Labor

well. Here, we were fortunate in the fact that there had already been an extensive development of automatic and semi-automatic machinery—a development in which we led the world.

It may be taken as axiomatic that, in the long run, no class of labor can continue to receive more than it produces. Temporarily, under stress of unusual conditions, one kind or another of human labor may receive disproportionate reward; but, in the final analysis, the worth of any kind of labor is determined by its productiveness.

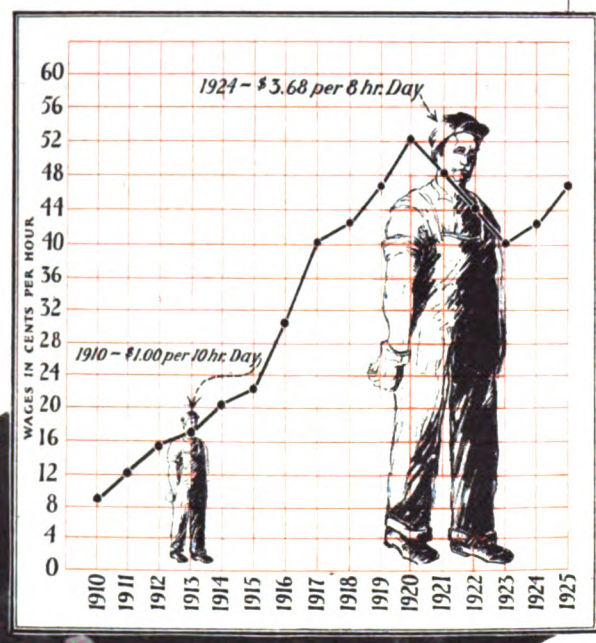


Fig. 3. Increase in common labor costs over a period of years. Note that the wage has risen, while the hours of work have been shortened.

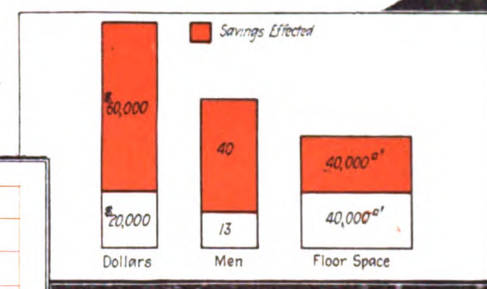


Fig. 4. These savings were made possible in a large chemical plant by changing the storage methods and installing portable elevators.

On this basis, referring back to the chart at the beginning of this article, what factor is it that makes present-day American labor (a composite of skilled and semi-skilled and unskilled workers) so productive as to command more than twice the wage of British labor, almost four times that of German labor?

Again, referring to the chart showing the fluctuation in wages of common labor, what accounts for the fact that in 1910 common labor received one dollar for a ten-hour day, while in 1924 the same class of labor received $3.68 for eight hours' work? True, the value of the dollar has changed; but this alone would not account for more than one-half the increase.

Obviously, the 1924 common laborer must, in eight hours, have accomplished more by his efforts than the 1910 common laborer was able to accomplish in ten hours. Obviously, too, the American worker, in the aggregate (including the skilled and

(*Continued on page* 88)

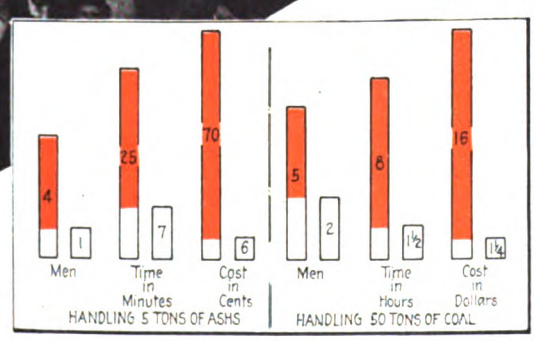


Fig. 5. Comparison of costs between hand shoveling and the use of portable conveyors for handling two different products.

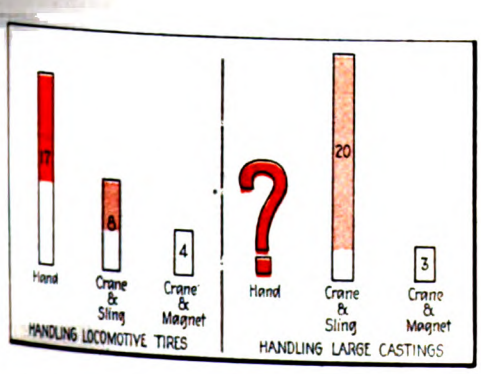


Fig. 6. The cost of handling. The principal reason for the efficient work of the magnet in handling heavy materials is on account of the difficulty of obtaining a good hold upon the heavy castings when they are handled by chains or hooks.

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Rotary Pumps and the Handling of Liquids

By William V. Fitzgerald

PUMPING of liquids is nothing more than a filling of the demands of modern industry for the quick and efficient production of commodities of every sort. Scarcely an industry exists today which does not in some form or other utilize the pump for transferring liquids from one place to another. This even applies to work where the liquid is merely an incident in the production of the main item of manufacture.

In the old days which have passed beyond recall, "industry" consisted in the individual supplying his own needs. It was personal, purely personal, and if the individual was not industrious, he merely failed to supply his own needs. His lack of effort did not affect the community at large. The women spun their own yarn and wove it into cloth. The farmer made his own tallow candles by dipping. He made his own brew from the materials nearest at hand.

Gradually, however, the individual became expert in some one line of endeavor. He became known about the village as a man who had a special adaptability for a certain line of work. Perhaps he made the best tallow candles or the best soft soap. Other people came to purchase from him and offered him in exchange, commodities in the production of which they had been especially fortunate. And so modern industry started.

There were many things that appeared to influence production in a plant. But there can probably be no more striking realization of just how much influence a single item can have, than has been demonstrated by the modern system of handling materials. The efficient handling of parts of a machine in assembling, or of ingredients of a mixture, is one of the biggest things modern industry has done to increase plant production without increasing the size of the plant and the overhead expense involved. The handling of liquids is certainly a very big part of this one phase, a bigger part than most people realize.

When one stops to consider that there is no industry which

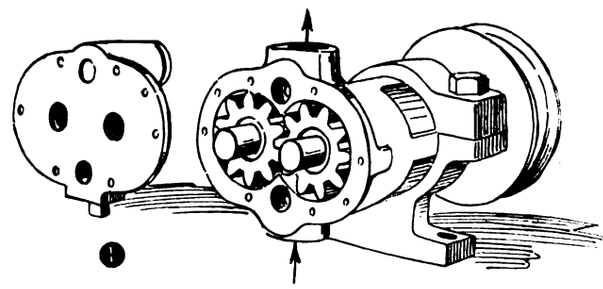


Fig. 1. A geared type of pump, in which liquid is taken in by suction, as shown by the arrows, and discharged through the other opening.

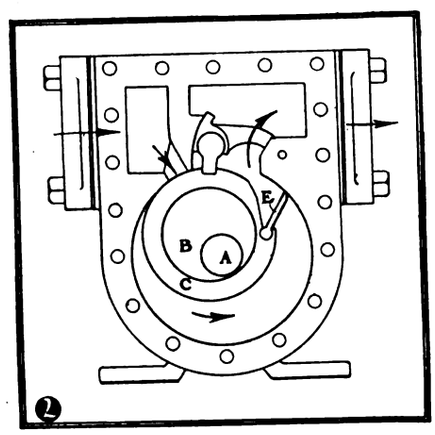


Fig. 2. Here, the piston (C) is mounted on the eccentric (B) which revolves with the shaft (A). The check plate (E) prevents liquid from slipping back during the pause in the pumping cycle.

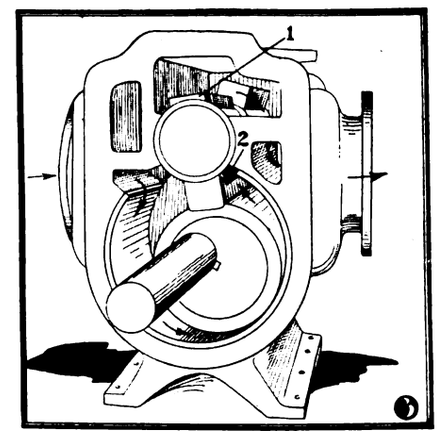
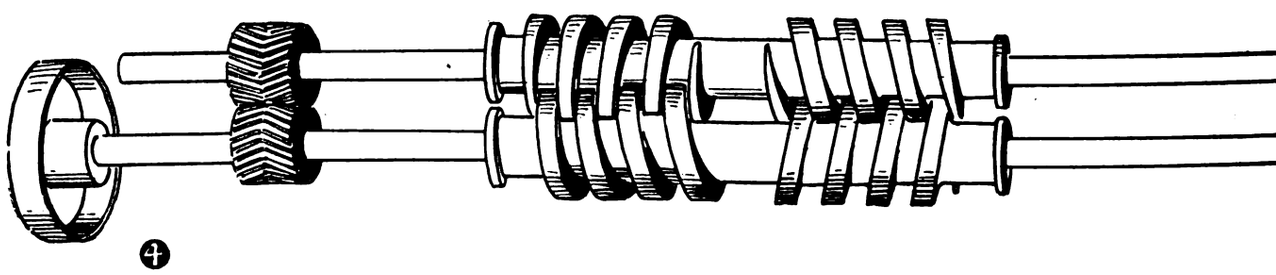


Fig. 3. This design is similar in principle to that shown in Fig. 2. Ports in the box-like section (1) prevent the return of pumped liquid.

Fig. 4. The screw pump, in which the liquid is trapped at each end of the pairs of meshed threads, and forced toward the center, without any thrust on the shafts.



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does not use liquids, one begins to grasp some faint ideas as to the tremendous importance of a seemingly small subject. When one stops to consider the widespread scope of those industries which handle liquids of a viscous or semi-fluid nature, or of a nature not easily handled in the common way that water is handled, another idea of equal interest is brought to mind. This is a field of industry that has been developing for only a comparatively few years and one in which much progress has been made in a short time.

The problem of handling viscous or semi-fluid liquids is essentially the field of the rotary pump. No other device has yet been produced for this work which approaches the simplicity or workability of these units. By rotary pumps, a number of different designs of apparatus is meant, each of which is especially adapted to some particular line of work but usable in several other lines. Every type of pump which is not properly classified in the centrifugal type or the reciprocating type comes under the head of "rotary pumps."

The first of these (Fig. 1) is a "geared type" in which two gears of equal size and having rather long teeth intermeshing are enclosed in a single housing. One of these gears is driven by belt or motor or by some other power, while the other gear derives its motion

(*Continued on page* 82)

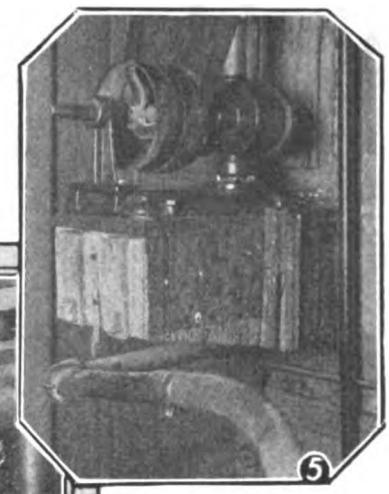


Fig. 5. Tucked away in a corner, this little rotary pump serves the installation shown in Fig. 6.



Fig. 6. Handling hot glue in a bag factory. The nature of the liquid, and the surrounding conditions, are anything but ideal for pump operation.

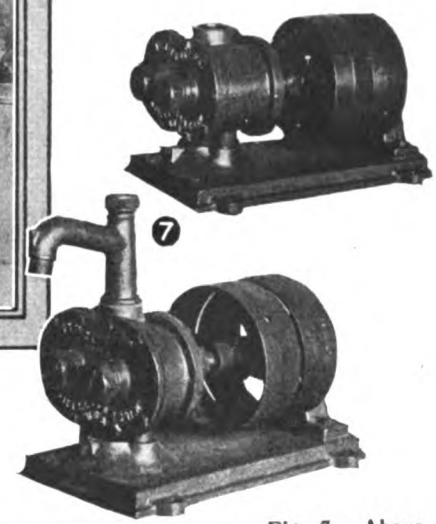


Fig. 7. Above —Such pumps as these are especially suitable for contractors' work, where a city water supply is not always available.

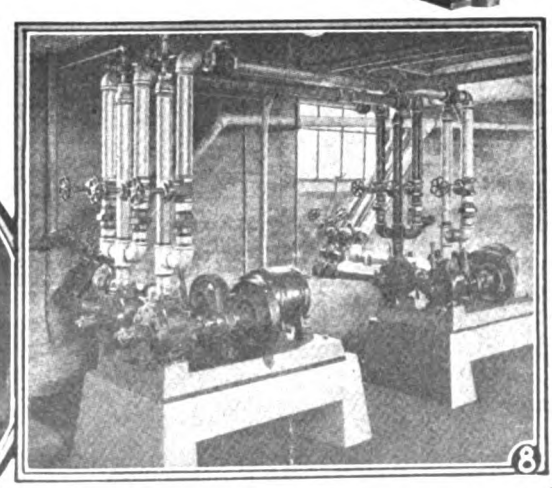


Fig. 8. A battery of rotary pumps, motor-driven, handling oil in a modern fire-proof pump house.



Fig. 9. A "barrel-pump" emptying varnish into a dipping tank. Evidently, the handling of liquids offers a considerable field for savings which can be made at small expense.

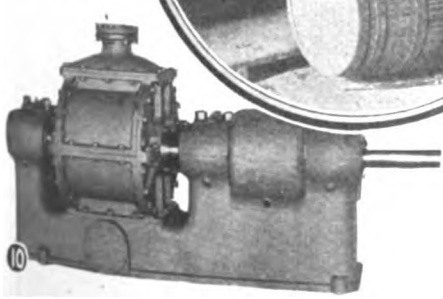


Fig. 10. A rotary pump built especially for vacuum work in paper making. Due to the acid and gritty substances handled, special construction is necessary.

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A Hero Who Refuses to Be Forgotten

How America's Ace of Aces Has Made a Place for Himself In the World of Industry

By Dwight G. Baird

ONCE upon a time, the story goes, tens of thousands of people lined the principal thoroughfare of a great city, shouting and strewing flowers in the way. The dignitaries of the nation were there, bands played, a guard of honor passed in review, women and girls threw kisses, and all shouted a name.

A stranger approached one of the throng and asked the meaning of the demonstration.

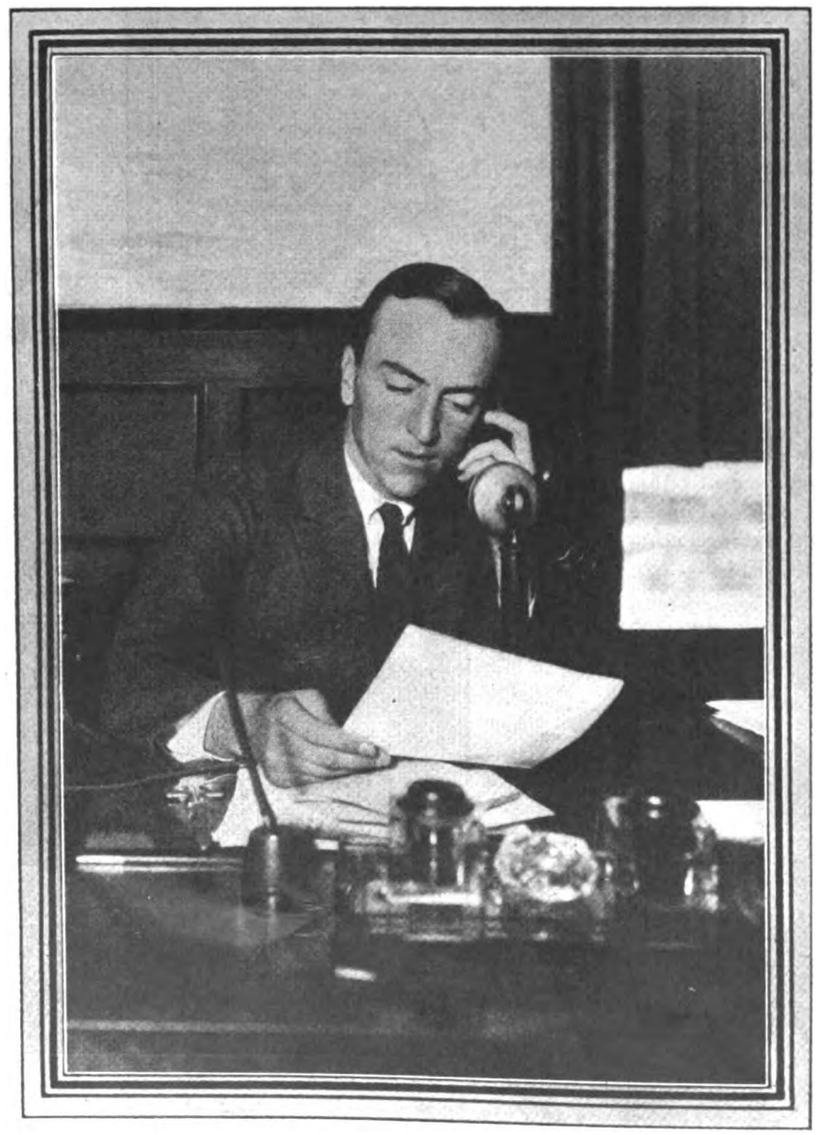
"Why, don't you know?" he exclaimed. "The hero of the day is passing this way."

Just then a silent figure, with collar upturned and hat pulled low over his eyes, slipped from the crowd and slunk into an alley.

"I wonder who that was?" the stranger mused, and the other answered: "That? Oh, that was the hero of yesterday."

Such is all too often the fate of heroes. Oblivion frequently follows close behind the world's highest honors. Even the struggle for existence may become harder for the hero because of the high place he has attained. Who today can so much as recall the name of England's ace of aces? Or of Canada's? Or of France's or Italy's?

But there is one hero who refuses to be forgotten; whose name is today more familiar than on the day when he was hailed as America's Ace of Aces and as the world's greatest soldier of the air. Skilled in the building, maintenance, and use of the gasoline motor before the World War began, "Eddie" Rickenbacker applied his knowledge and talent in winning twenty-six official victories over enemy airmen during the few months of his participation in the world conflict. Returning to civilian life after his discharge from the army, he applied the additional knowledge and experience he had gained during that time and produced the Rickenbacker automobile. Not only does his company and its product bear his name, but as vice-president and director of sales, the former ace of aces is equally as dynamic, industrious, and resourceful in business as he formerly was in war and is rapidly convincing the public that the name is worthy of the car.



"EDDIE" RICKENBACKER, America's hero aviator during the war, who has applied the same dynamic energy to the winning of combats in the peace-time industrial world.

"Eddie" Rickenbacker did not become what he is today by chance, inheritance, or mere good fortune. His success in bringing down twenty-

(*Continued on page* 61)

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Cooling Death Valley

How Industry Combats Climatic Extremes

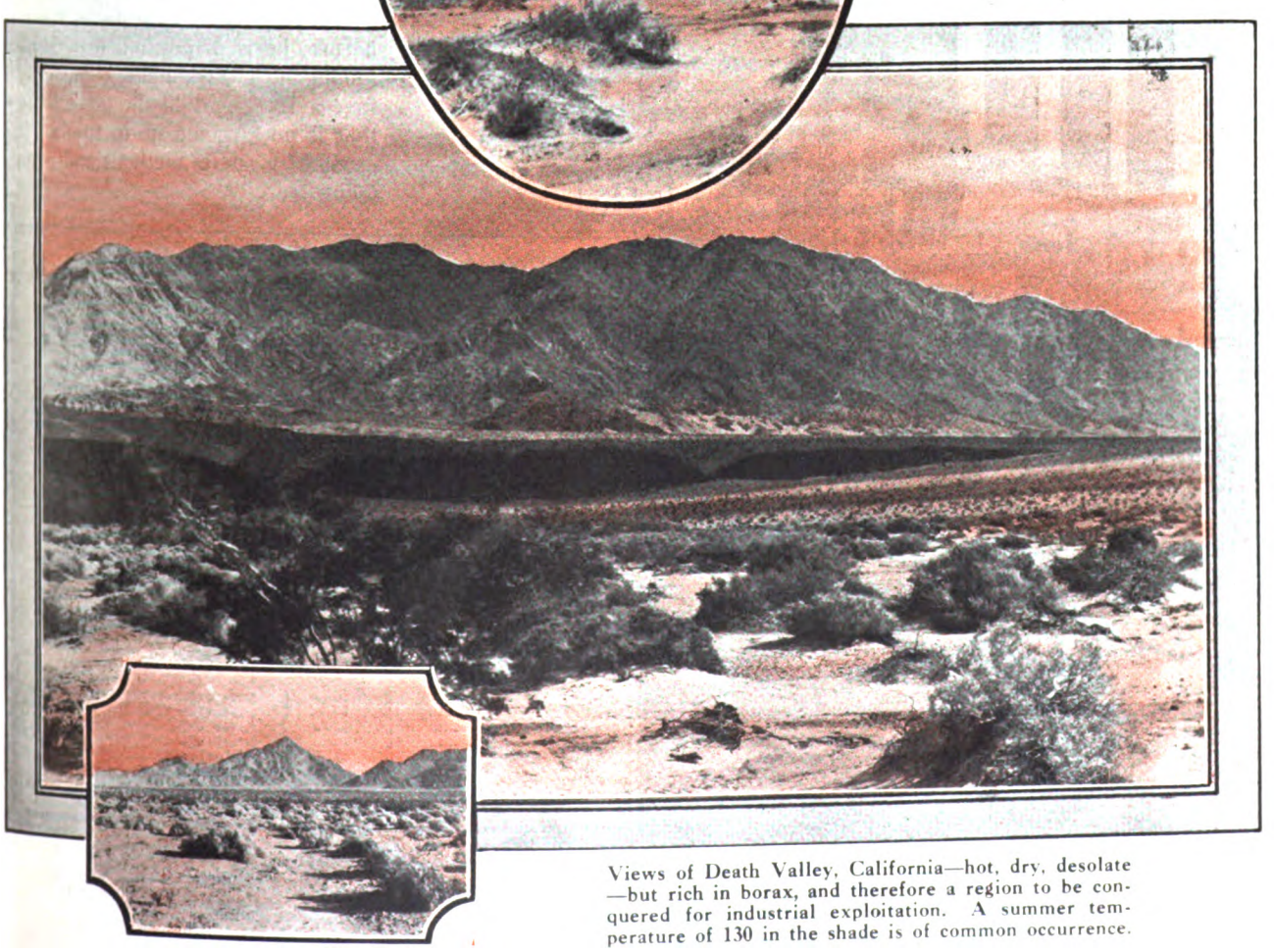
By Arthur L. Greene

MAN'S curiosity of the unknown, his search for new wealth, his travels and explorations have brought him in contact with many varieties of climate—some conducive to progress, others quite the reverse. History has proven, for instance, that the dominance of one race over another is due frequently to the factor of climate, which makes the one strong, alert and forceful, while the other is inert, soft and hesitant. Up to very recently, attempts toward reducing climatic extremes have been waged solely against the cold; as a result the present day finds us considerably further advanced in our defense against this element than against that of heat. Only within the past few years has the subject of air cooling and humidity been recognized as one offering as big opportunities in development of our industries, our health and our national wealth as that of heating.

Lying to the west and southwest of Salt Lake City, and extending to the Sierra Nevada and the ranges east of Los Angeles, is an area designated as the Great American Desert. A section of this, lying in southeastern California between Telescope and Panamint Mts., and over 200 feet below sea level, is called Death Valley. This name was given because of the loss of a number of emigrant parties who attempted to cross here in the California gold rush of 1849. Since then various individuals have been lost in this region, thus tending to keep up the sinister name.

Practically all of the development of Death Valley has been undertaken by parties interested in borax. "Colemanite" (borate of soda) is found in the hills and mountains high above the flats of the valley bottoms, while "cotton ball" 'borate of soda) is found in

(*Continued on page* 80)



Views of Death Valley, California—hot, dry, desolate—but rich in borax, and therefore a region to be conquered for industrial exploitation. A summer temperature of 130 in the shade is of common occurrence.

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How to Know Your Power Costs

The First Step Toward Reducing Them

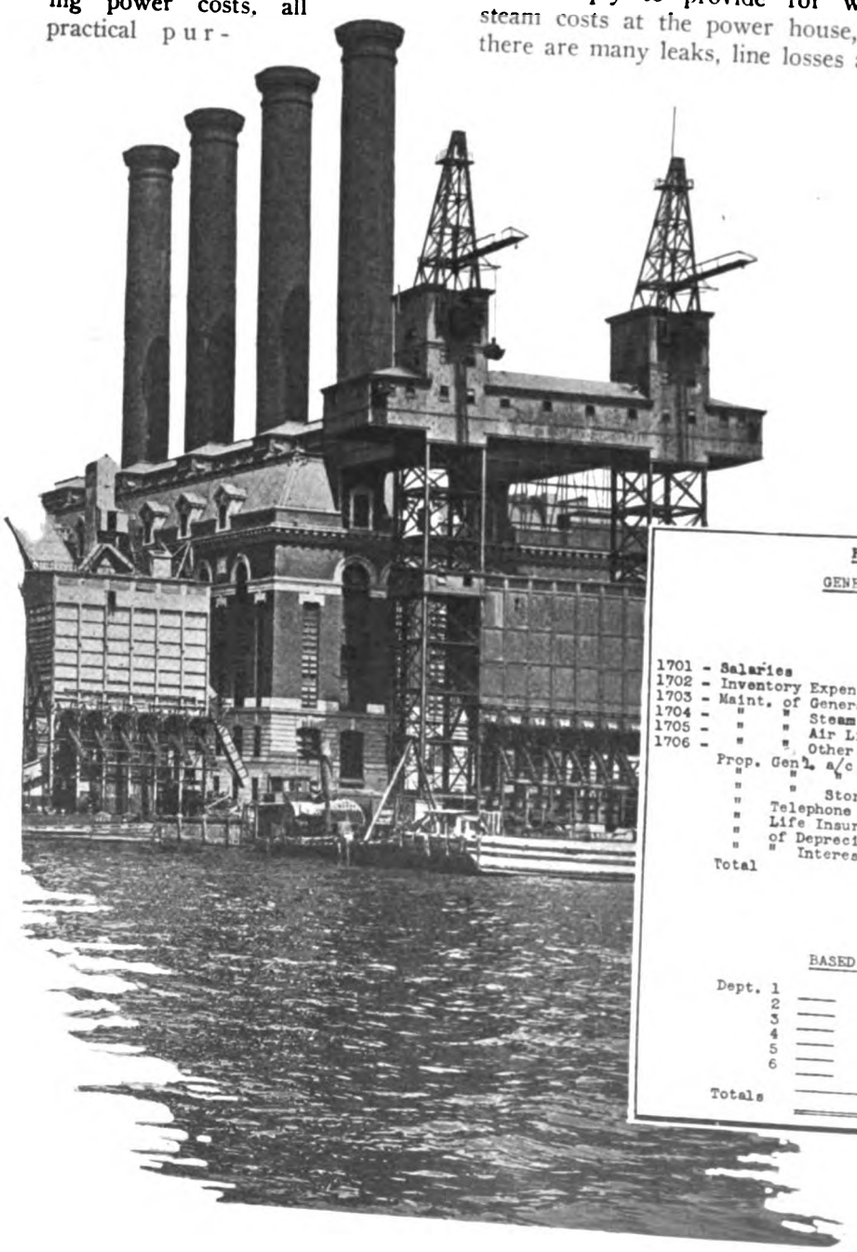
By J. P. Jordan

IT is entirely up to the executive function of the business to provide the means to know the cost and use of power. The day of considering power cost as a necessary evil and thereby neglecting to analyze and curb it is long past.

While it is perfectly possible to make a very complicated and technical job out of the operation of figuring power costs, all practical purposes are well served by methods which may not be technical enough for a very technical man, but which are comprehensive enough to give data from which the costs of power may be known and its uses checked.

In dealing with the power problem it is far from sufficient to deal with any one phase. That is, it is not sufficient simply to provide for what steam costs at the power house, as there are many leaks, line losses and wastes besides the actual uses for which steam is generated. Steam, electricity and compressed air are all subject to transmission losses, and each is subject to wastes in use. Water and gases of all kinds are subject to waste, but their line losses are of course less than with the direct power items.

A simple series of forms, however, such as illustrated on these pages, will serve, in the majority of cases as a mechanism or frame work for the construction of power costs. The forms with their captions are self-explanatory, and will insure, for the executive, a pretty definite knowledge of not only what power is costing as a whole, but also show in detail where the money is spent, for it is going. When one knows these facts, and not before, he is in position to begin an intelligent and profitable campaign to save a large part of the good money that is now "going up in smoke" because of wasteful methods and equipment.



POWER ACCOUNT 1

GENERAL POWER EXPENSE

	Year to Date	This Mo.	Last Mo.
1701 - Salaries			
1702 - Inventory Expense			
1703 - Maint. of General Elec.Lines			
1704 - " " Steam Lines			
1705 - " " Air Lines			
1706 - " " Other General Power Equip.			
Prop. Gen'l. a/c No. 1			
" " " 2			
" " Stores			
" Telephone			
" Life Insurance			
" of Depreciation on Equip.			
" " Interest " "			
Total			

DISTRIBUTION

BASED ON SERVICE TO DEPARTMENTS

Dept. 1	____	$	____
2	____	"	____
3	____	"	____
4	____	"	____
5	____	"	____
6	____	"	____
Totals			

Some departments require more attention from the head of the Power Department than their power use indicates. This distribution is therefore by agreement.

Fig. 1. Above is a simple form of monthly statement for keeping track of the general power expense.

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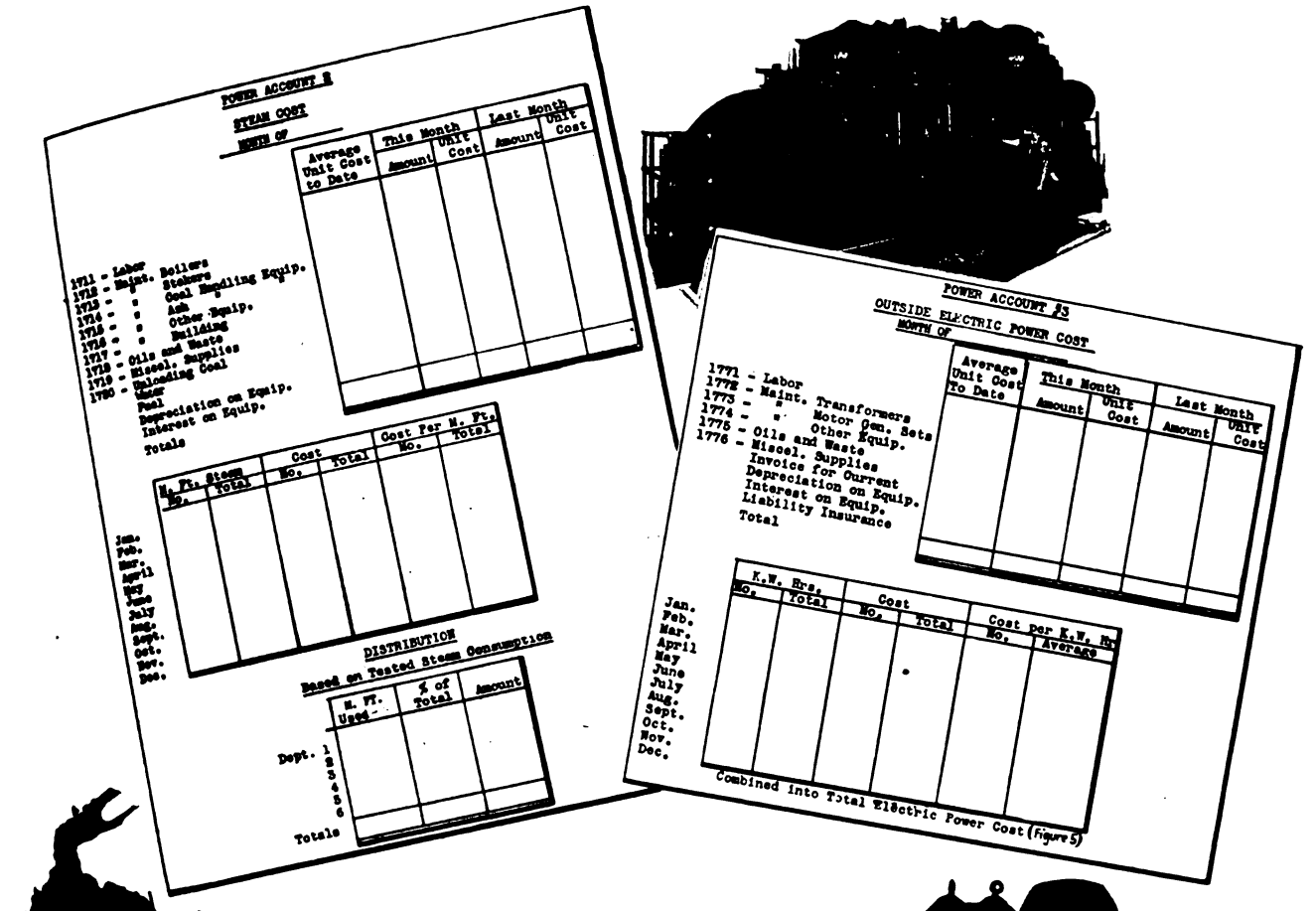
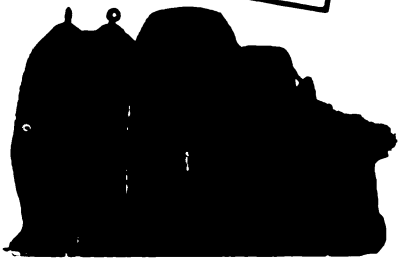


Fig. 2. The actual cost of steam consists of an assemblage of the costs of fuel, water, labor, maintenance, and fixed charges.

Fig. 3. The cost of outside - generated electric power is, of course, the simplest cost to find.





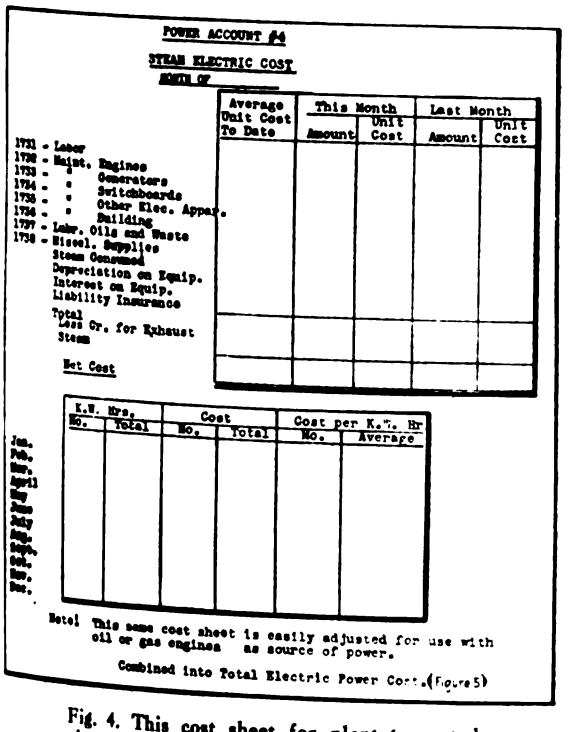


Fig. 4. This cost sheet for plant-generated electric power is readily adapted to oil or gas engine, as well as to turbine or reciprocating steam.

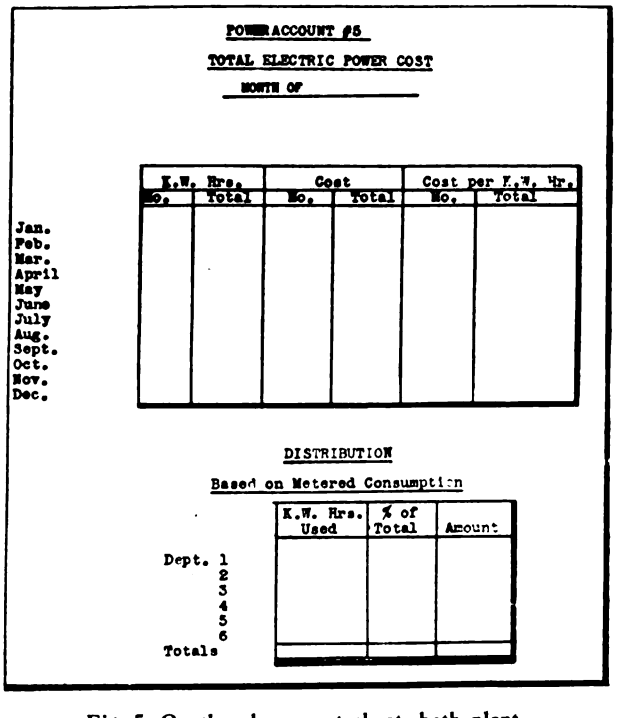


Fig. 5. On the above cost sheet, both plant-generated and purchased electric power are brought together.

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How Conveyors Cut

A Modern Warehouse

By Matthew

THROUGH the courtesy of the Endicott-Johnson Corporation, we are presenting this article describing the materials handling methods employed at their warehouse in Jersey City, N. J. This warehouse is in no way connected with the manufacture of shoes, but serves only as a general sales office and distribution center for a fairly large area in the vicinity of New York. In this territory, millions of pairs of shoes are sold each year by the Endicott-Johnson Corporation and to handle this volume of business it is necessary to receive many thousands of cartons from the main factory at Endicott, N. Y., and also to ship out hundreds of thousands of packages on individual orders.

While the goods are received from the factory in carload lots, they are shipped from the warehouse via express and truck service in small orders, ranging anywhere from one to twelve packages. In addition, a considerable volume of business is done by parcel post. In planning this warehouse, the handling of this quantity of material presented a problem in the cost of distribution, as a large

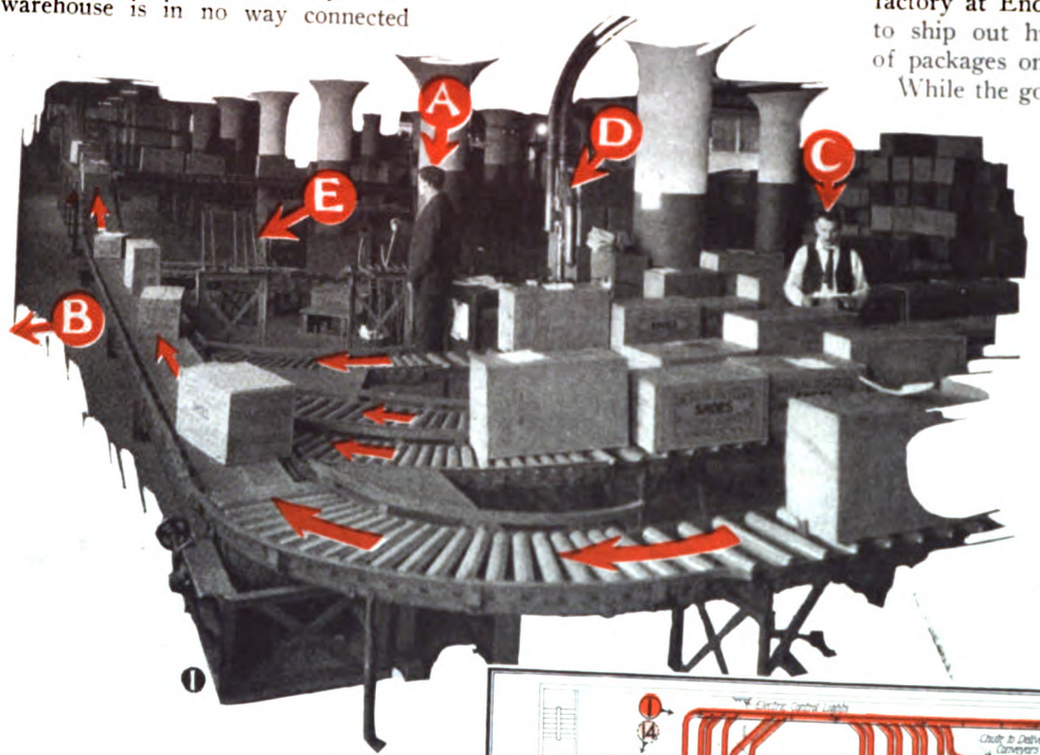


Fig. 1. "A" shows man controlling diverters on express conveyors. "B" is the location of electric control lights. "C" is checking bills of lading. "D" are pneumatic tube conveyors connecting to main office. "E" are control levers for diverters on conveyors in the basement.

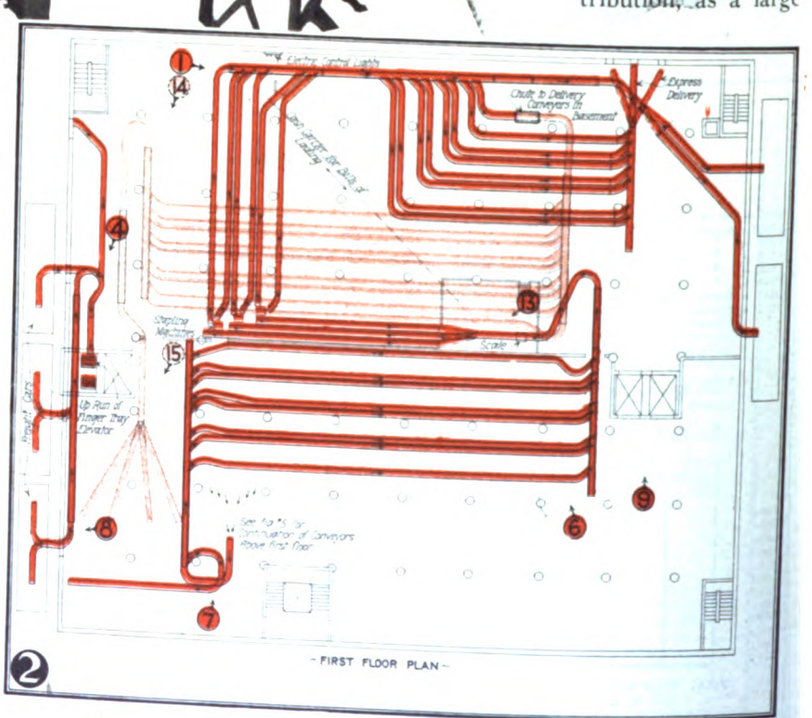
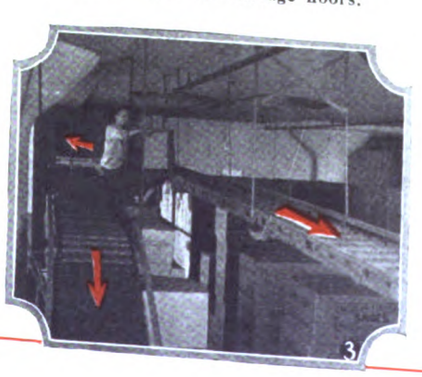


Fig. 2. First floor plan showing conveyor layout. Conveyors shown in heavy red are located on the first floor, while those shown in light red are located in the basement.

Fig. 3. View of the dispatcher working on one of the storage floors.



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Distribution Costs

Distribution System

W. Potts

portion of the cost would be the labor required for handling. To reduce costs and to facilitate the receiving of goods and the prompt shipment of orders, the entire warehouse is now equipped with conveyors, elevators, etc., so as to eliminate as many hand handlings as possible.

A diagrammatic layout of the entire system for handling both incoming and outgoing packages is shown in Figs. 2 and 5. Fig. 2 shows the method of unloading cars, delivering goods to the express company's delivery platform, and also to the trucking platform for local orders. In addition, the packing conveyors, stapling machines, etc., are also shown. Fig. 5 shows the method of receiving the packages on the various storage floors which are three in number, namely, the third, fourth, and fifth floors. This layout is typical of each floor and shows the conveyors for handling incoming packages and also the conveyors and spiral chutes for handling outgoing orders.

In order to assist the readers we made these diagrams rather complete, showing conveyors on a given floor in solid line and, at the same time, showing in dotted lines the conveyors on the floor be-

(*Continued on page 92*)

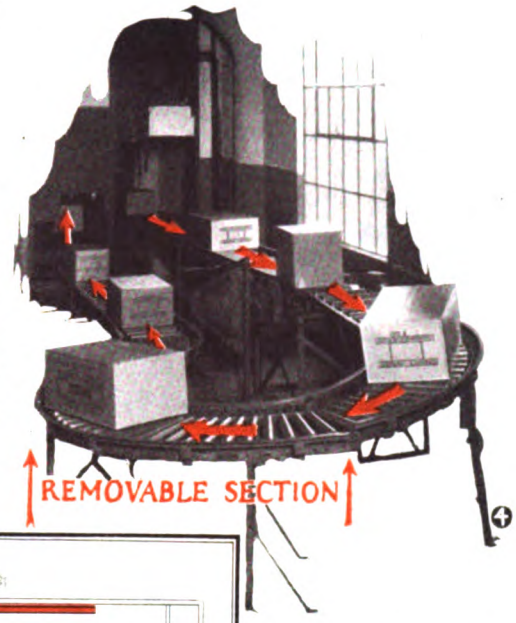


Fig. 4. Gravity and belt conveyors feeding incoming packages to finger tray elevator at first floor level.

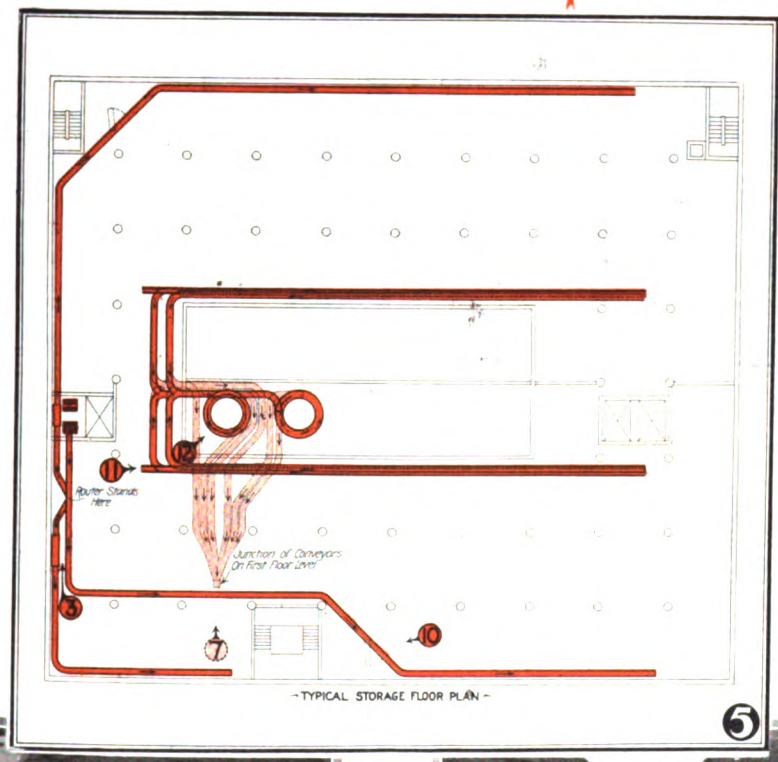


Fig. 5. Typical storage plan showing location of various conveyors and spiral chutes.



Fig. 6. Transferring shoes from order picking boxes and packing same in cardboard cartons for shipment.

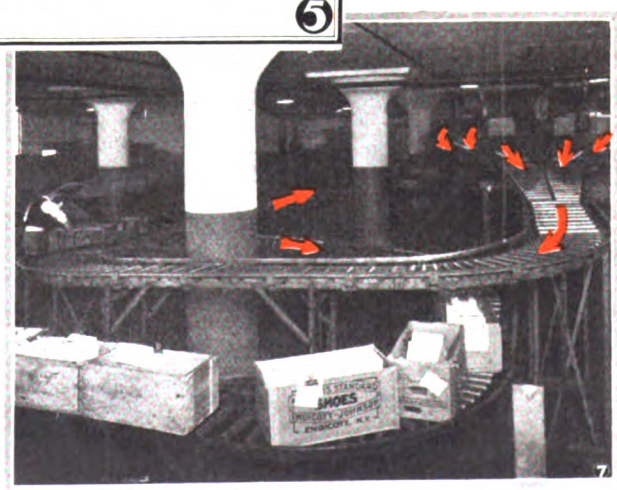


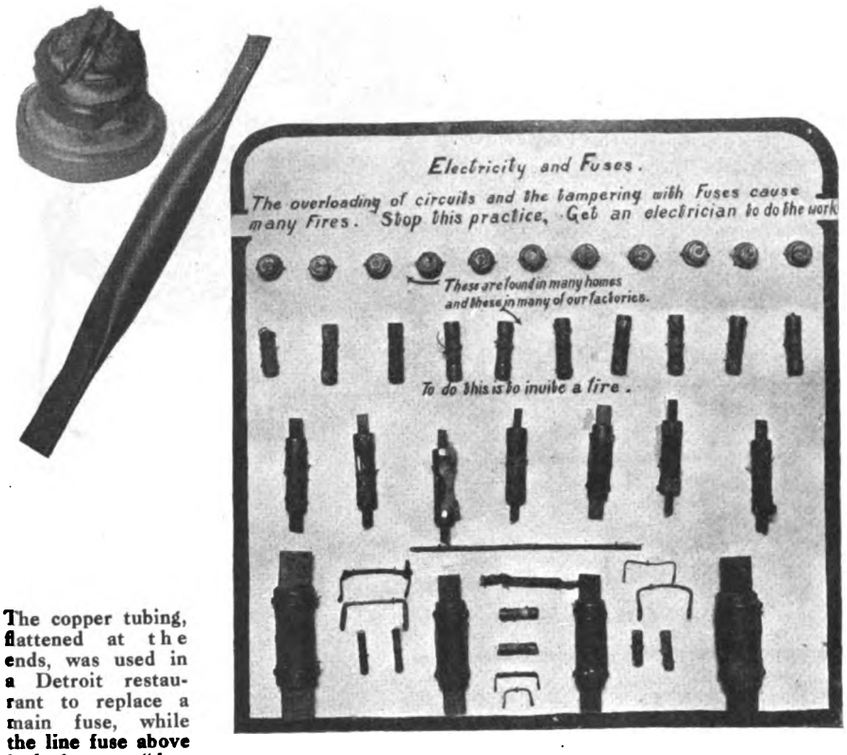
Fig. 7. Junction point of conveyors coming from the storage floors in feeding orders to the packing conveyors.

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Do Your Fuses Really Protect?

By Benjamin W. Clark

Chief Inspector, Department of Electrical Inspection, City of Detroit



The copper tubing, flattened at the ends, was used in a Detroit restaurant to replace a main fuse, while the line fuse above had been "doctored" as shown. At the right are some examples of what not to do.

WHAT the safety valve is to a steam boiler, the fuse is to an electrical circuit.

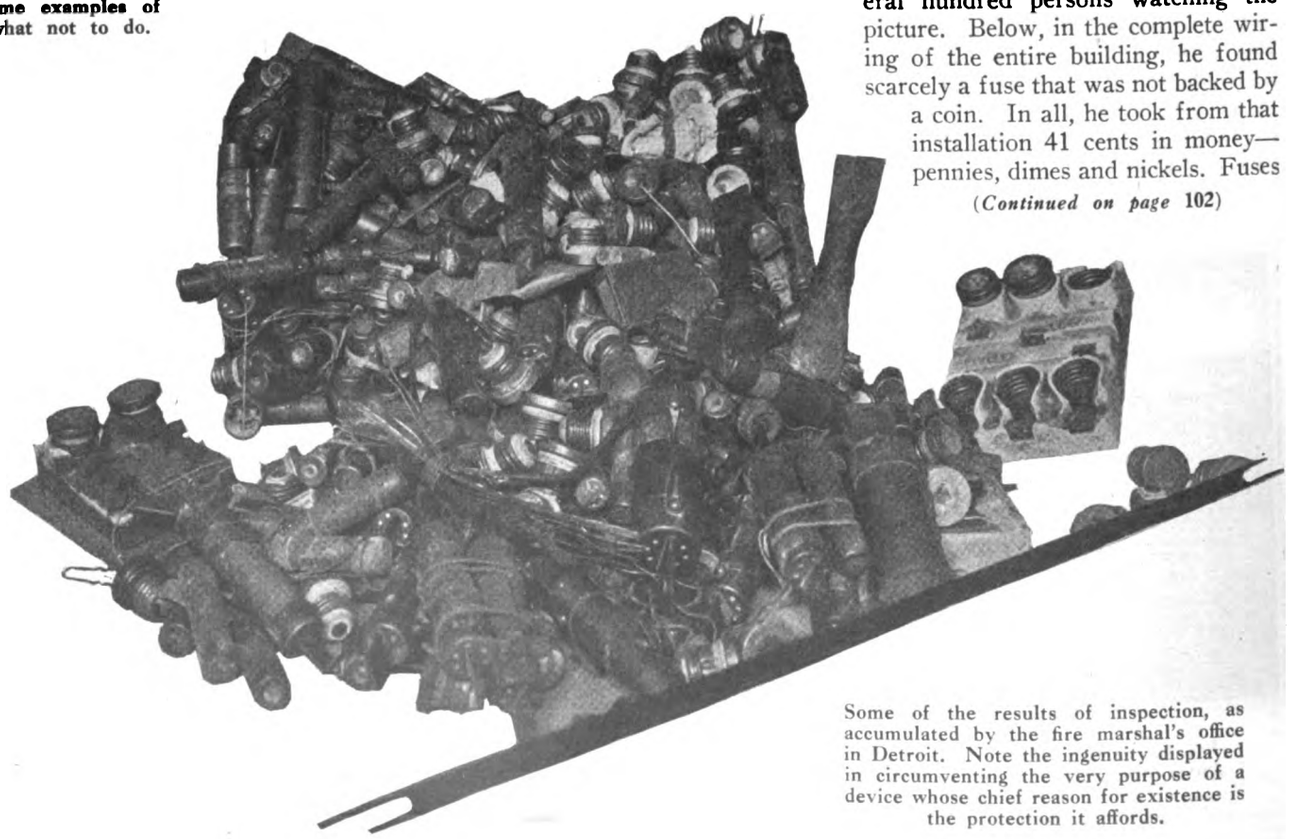
When a boiler is overloaded, the safety valve lets go or else the boiler lets go. When an electrical circuit is overloaded the fuse blows out—and if there is no fuse, serious consequences may follow.

Is it not strange that the electrical industry, the Underwriter's Laboratory and Municipal Inspection Departments, having gone to so much trouble and expense to make the use of electricity safe, are in so many cases willing to let their efforts go for nothing by permitting users to tamper with the safety valve of the installation—the fuse?

Rarely do people monkey with the safety valve on a boiler, or overload it with weights, yet it is an everyday occurrence for them to tamper with fuses.

One of our inspectors a few years ago visited a neighborhood motion picture theatre on one of his regular inspection trips. Overhead sat several hundred persons watching the picture. Below, in the complete wiring of the entire building, he found scarcely a fuse that was not backed by a coin. In all, he took from that installation 41 cents in money—pennies, dimes and nickels. Fuses

(*Continued on page* 102)



Some of the results of inspection, as accumulated by the fire marshal's office in Detroit. Note the ingenuity displayed in circumventing the very purpose of a device whose chief reason for existence is the protection it affords.

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Management and Diet

Factors Behind the Growth of the Industrial Lunch Room

By E. M. Metcalfe

IN the entire United States there are over 4,000 industrial cafeterias, operated solely for the employes of factories, banks, mills and public service corporations, where employes are fed to the number of 4,000,000. In some of these cafeterias only a nominal charge is made for the food. A large Boston insurance firm charges ten cents for a sixty cent lunch. In others, meals are served at cost price.

As a matter of fact, American industry is committed to the principle of feeding employes for benefit and protection. More than fifty large plants in the East have added modern cafeterias for employes during the past year. The large steel mills of Pittsburgh operate cafeterias for their various types of workers, the fare being guided by the class of work they are engaged in.

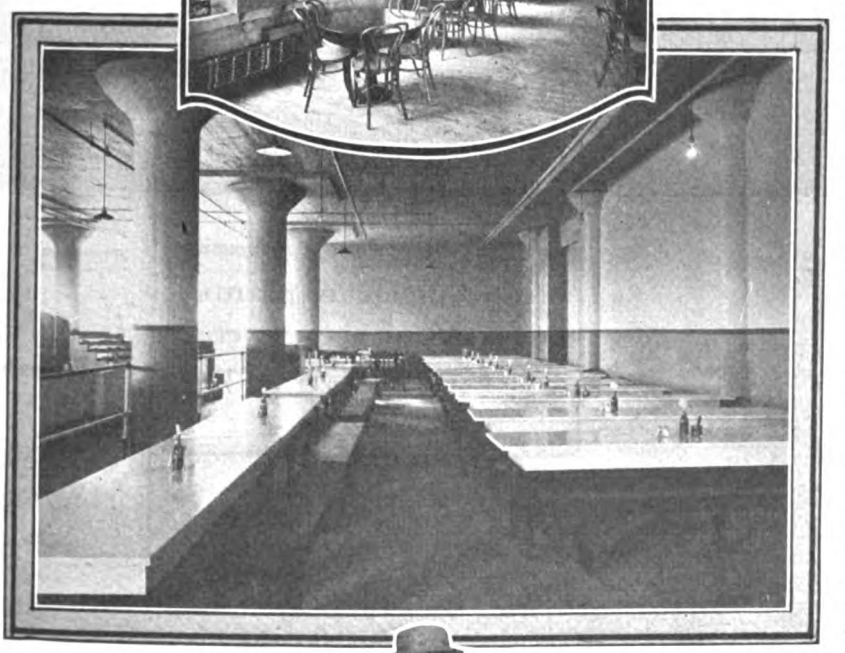
Behind this feeding movement is a desire to have workers fed properly, making for efficiency. Secondarily, the present short business day presumes a briefer noon hour and only the cafeteria right on the ground will do the trick. This need for speed has greatly extended the cafeteria idea, self-service being best adapted in industrial needs.

Employes in the larger plants are fed in three shifts as a rule. In some plants the men and women eat separately. In others, special diet is supplied for undernourished or unhealthy employes, menus being planned by staff dietitians under a doctor's orders. This idea is carried out in every detail in one of the large cloak and suit factories employing 7,500 women and girls.

The manufacturers of modern cafeteria equipment find the large industrial concerns among their best buyers. Any firm big enough to feed its employes along proper lines, even at considerable financial loss, is pretty sure to buy all the modern labor saving devices on the market; and they do. In one Manhattan industrial-welfare cafeteria, seating 1,000 at a time, everything is done by electricity that can be done by electricity. Vegetables are prepared by machinery, baking is done on the

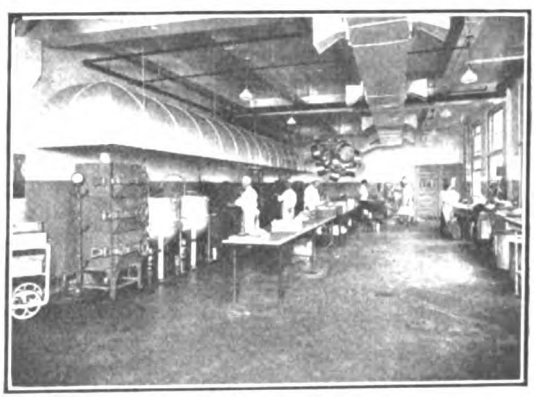
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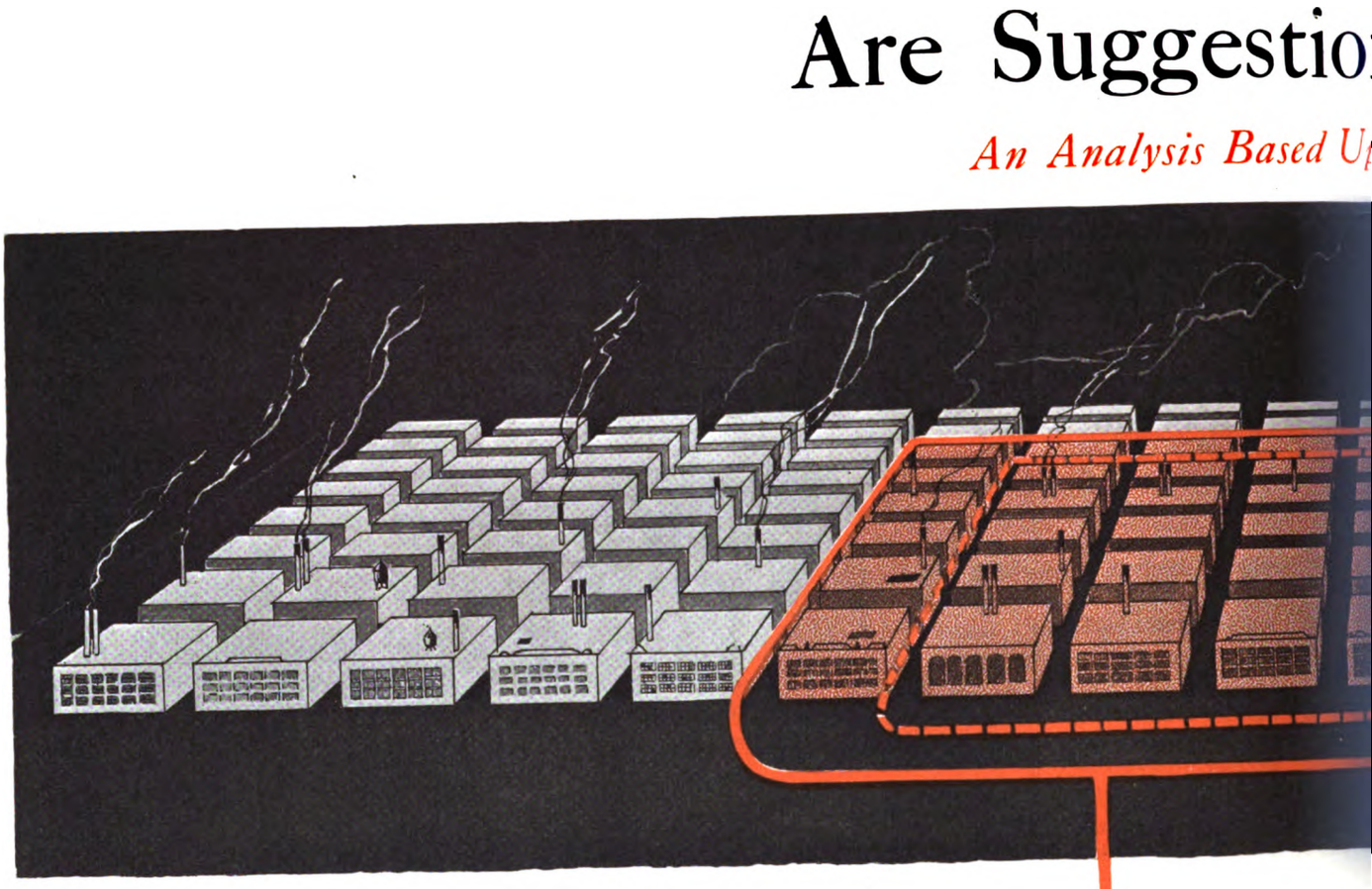
The views on this page are of employee dining rooms and cafeterias representative of present-day practice in industry.

The modern plant kitchen is similar to that in the best hotels, embodying the best in sanitary and labor-saving features.

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Are Suggestio

An Analysis Based U



ARE employe's suggestion plans worth while or worthless?

What is the actual status of the suggestion system in American industry? Our editors made a study of this question by means of a questionnaire which was sent to some 1,100 American manufacturing concerns. The results are epitomized on these pages. In studying these results you must take into consideration the fact that the 160 concerns which replied to the questionnaire were among the more progressive concerns, not only because they took interest enough in the questionnaire to reply to it but because the original questionnaires were directed to a list of companies known to be successful.

Thus the proportions given in the analysis may be said to be representative of suggestion plan practice among *successful* American plants. If an actual canvass were taken of *all* plants the proportion using suggestion plans would undoubtedly be less than the three in eight ratio.

One of the reasons why so many suggestion plans have failed is because those who make suggestions or offer ideas which have been accepted and put into practice have felt that they have been inadequately rewarded. Some concerns, for example, give a dollar for each accepted suggestion. The employe naturally feels that he should be recompensed somewhat in proportion to the actual value of his suggestion. If it saves the company a great deal of money he feels that this should be taken into account in determining the reward.

Every progressive manager should be willing to invest money in ideas which will save money. If he can get an idea for $500 that will save his company $5,000 it is as good an investment as purchasing a machine for $500 which will cut the cost of product $5,000. The difficulty has been that most concerns—we are speaking now of the ones that have successfully tried the suggestion system—have failed to actually measure the results of the ideas submitted and applied.

160 American plants represented above were investigated by our editors

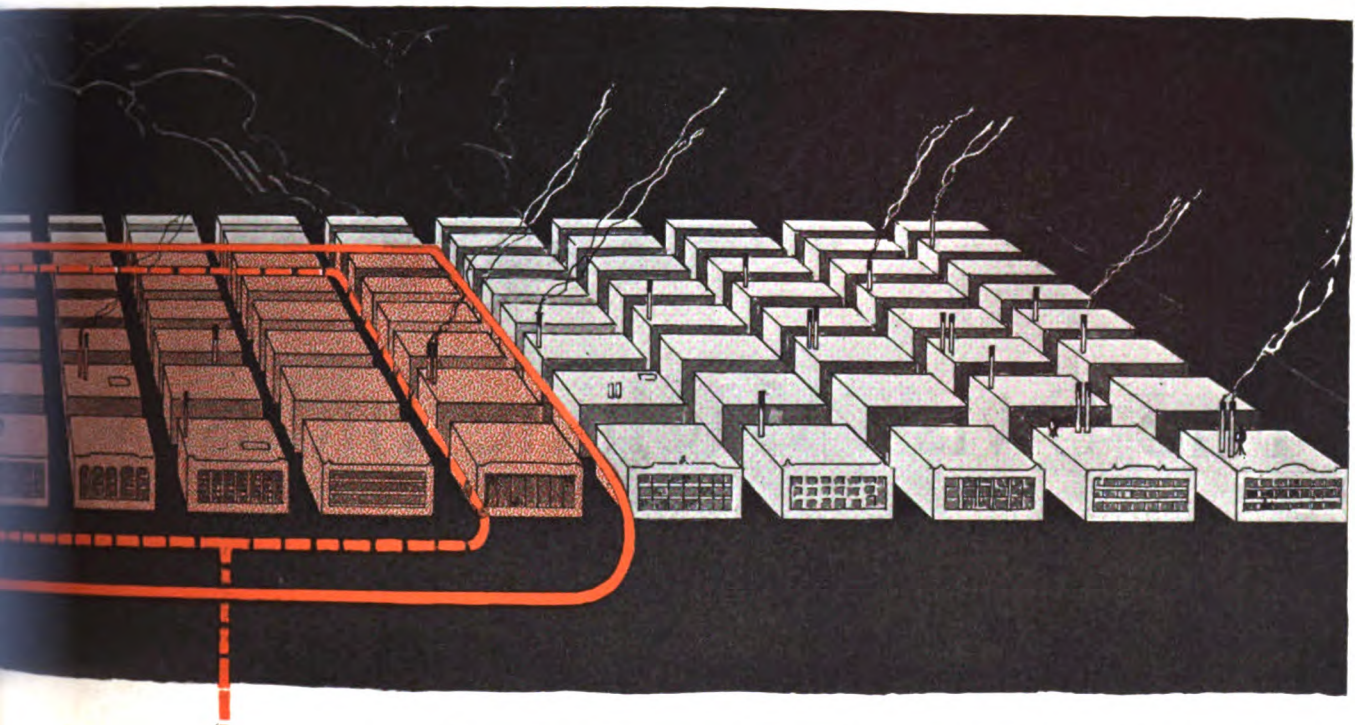
Of these, 60 plants employ suggestion systems

The cost system should be used for this purpose. Two-thirds of the plants shown above which are using suggestion systems keep track of the savings made through suggestions, by means of their cost systems. Almost as many use their cost systems to indicate the lines in which suggestions are needed. In other words, they invite employes to think up the answers to certain definite questions of cost reduction, which is a much better way of getting results than to let them come in at haphazard. A large concern manufacturing small electrical equipment has worked out and is using a suggestion plan in which the awards are based on the actual value of the ideas accepted as

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ystems Profitable?

ctual Plant Practice



Of the 60 which use suggestion plans, 40 measure the value of accepted suggestions by cost records

37 of these plants direct suggestions along specific lines, by cost analysis

usable. The methods employed, which follow, will be of interest to many executives:

"To encourage suggestions leading to improvements in methods or process which results in reduced costs, the following rewards will be paid:

1. If an employe, other than a foreman or sub-foreman, originates the suggestion:
   Net Savings for a period of six months.
2. If a sub-foreman originates the suggestion:
   Net Savings for a period of three months.
3. If a foreman originates the suggestion:
   Net Savings for a period of two months.

Improvements in methods and process are part of the duties of a foreman and sub-foreman, for which they are paid higher rates and therefore, they are not entitled to as large a reward as other employes.

4. As an incentive to foremen and sub-foremen to encourage suggestions from the members of their departments, an additional reward, equal to 10% of the amount paid to their employes for accepted suggestions during the preceding month, will be paid monthly to the foreman and sub-foreman directly in charge of the employes making such suggestions.

The net saving shall include:

(a) Saving in material based on actual reduction in quantity or cost, and

(b) Saving in labor based on the difference between the standards originally set and the standards set when the improvement goes into effect.

"The estimate of the quantity of goods to be produced during the succeeding two, three or six months shall be based on past usage.

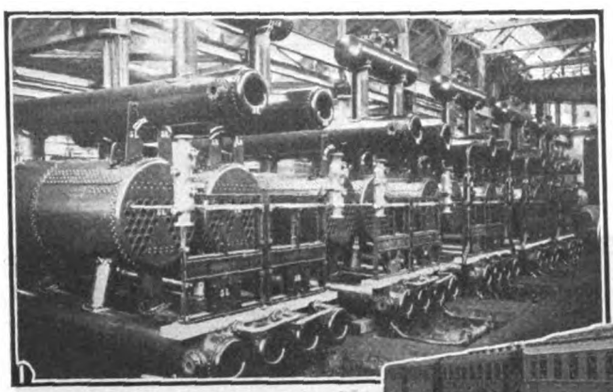
"No deduction will be made for changes in tools or equipment unless their cost is excessive.

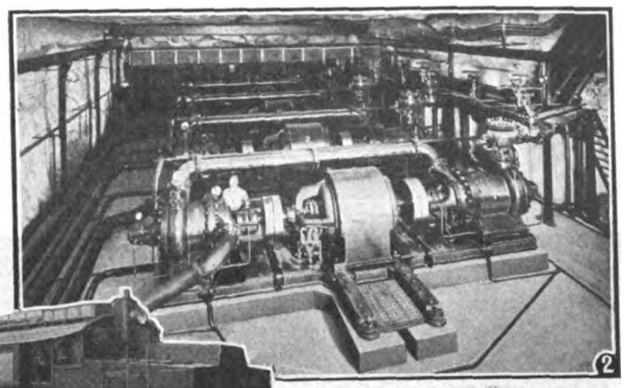
"Work will not be subject to suggestion awards until after process has been definitely set and standards permanently established.

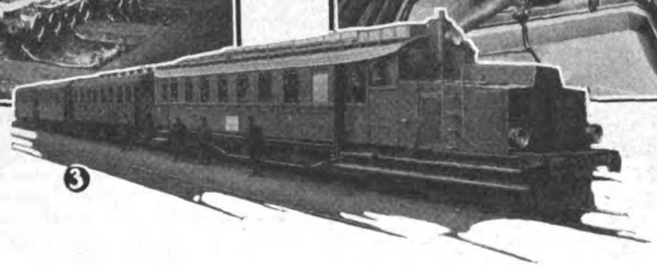
"To receive the reward herein outlined, employes must report the improvement in methods and process which they think should be made, so that same can be approved and new standards be set at the time the improvement goes into effect.

"Use the regular suggestion blanks and envelopes. Suggestions will be acknowledged promptly and then carefully investigated. If it is decided to adopt them, the improvement will be put into effect as promptly as possible and within two weeks from the date the new standards are set, the reward above specified will be paid in a lump sum."

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Figs. 1 and 3. Above, a boiler plant for South America; at the right, a Diesel motor rail car.

Fig. 2. These pumps, in a South African gold mine, are a Swiss product.

The Swiss Machine Industry

An Exemplary Phase of Man's Ingenuity Over Nature

By Arthur L. Greene and Henry Obermeyer

SWITZERLAND as a land lacking in great mineral resources would scarcely seem destined to have become a great industrial country, and one would surely have thought that if any industries did develop, engineering would certainly not be among the greatest of them. But here again history has stepped in and proved that the moral and psychological factors have much more influence on the development of a people than have their material circumstances. In the case of Switzerland, particularly, it is due above all to the energy and professional aptitude of the pioneers that so many great industrial enterprises have been founded in this land-locked republic, surrounded on all sides and subject to intense competition by some of the greatest of all industrial nations in the world—Germany, France, Austria, and Italy. Despite these great handicaps, however, and perhaps because of them, Switzerland can today lay claim to the distinction of having surmounted the difficulties of lack of internal resources and to have developed side by side with its larger and more powerful neighbors, an engineering industry that in some few instances surpasses that of any nation in the world.



Fig. 4. Corner in a large Diesel engine plant in the little mountain republic.

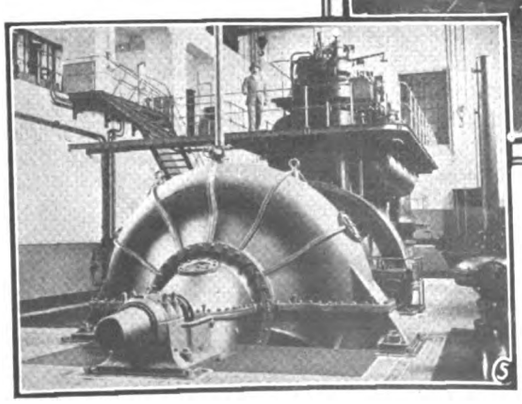


Fig. 5. A 2,000 hp. engine and pump, of Swiss manufacture, on an irrigation project in Egypt.

The industries of Switzerland can never hope to achieve perhaps that great aim of all nations—namely, to become self-supporting and self-sustaining. But for many years back this nation has formed a counterbalance for its lack of natural resources by developing a skilled engineering force and a group of skilled mechanics having no peer in the world. It is perhaps due to this one factor that Switzerland can boast today of

(*Continued on page 71*)

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The World's Largest Multi-Story Building

By Kenneth Rothermel

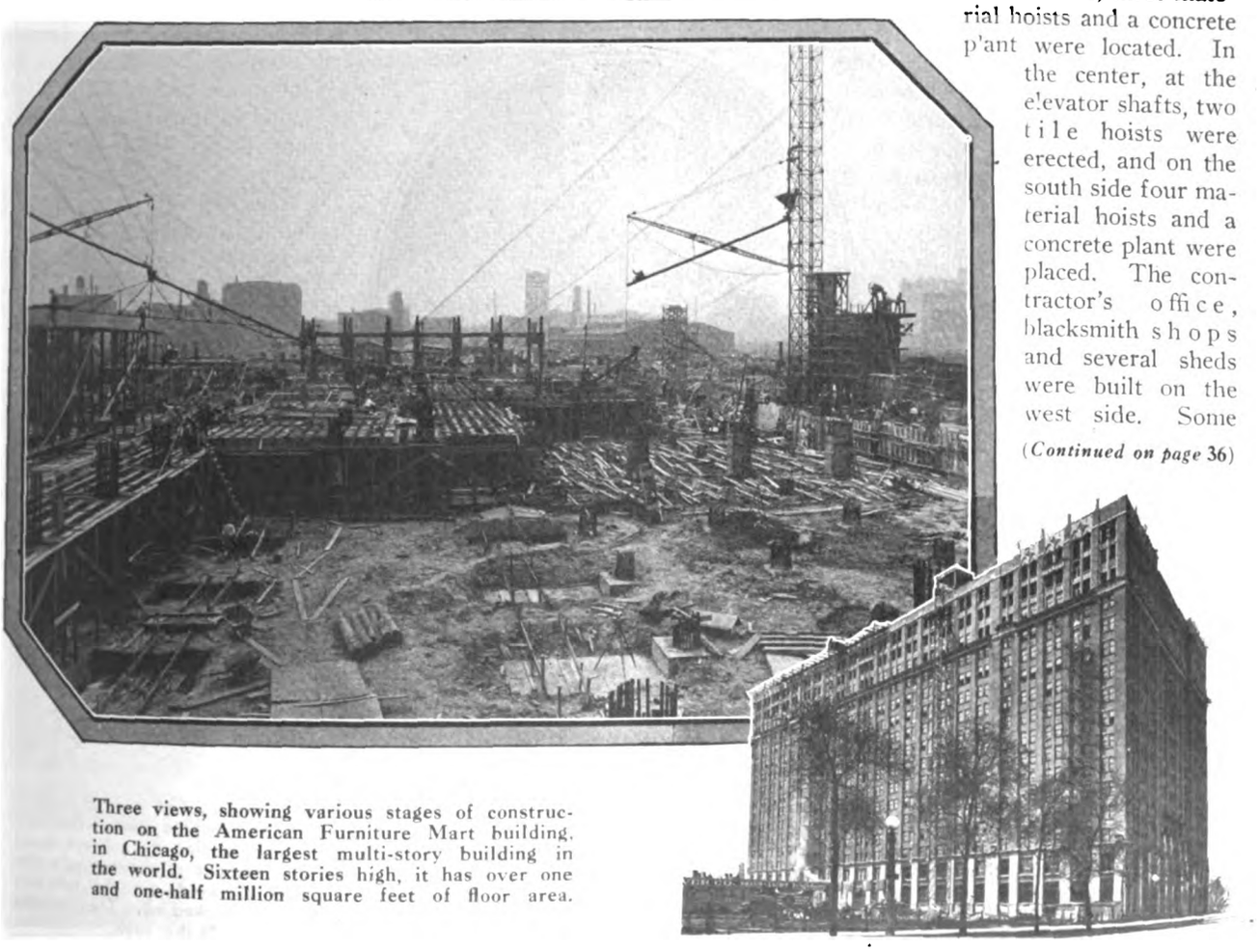
ON Lake Shore Drive in Chicago, just north of the Loop, is located the new $10,000,000 American Furniture Mart. This building, which is in the final stages of construction and will be completed early this summer, has a floor area of 1,500,000 square feet and is the largest multi-story building in the world under one roof and entirely built at one time. It is of Gothic style, 218 feet wide and 466 feet long on the greatest side, and contains sixteen stories. Although unintentionally planned to mark the one-hundredth birthday of the invention of Portland cement, this gigantic reinforced concrete structure will be completed just one century after Joseph Aspdin, an obscure English brick mason, was awarded the first patent for Portland cement by King George the Fourth.

The purpose of the new American Furniture Mart is to provide a consolidated market, display sales rooms, and a permanent home for the entire furniture industry. Chicago is the greatest furniture market in the world. Over 350 furniture manufacturing establishments are located in the city and within a radius of 500 miles live more than 18,000 retail furniture dealers who serve 50,000,000 people.



To undertake the construction of the mart was to assume a huge task requiring the inauguration of many new ideas. Fortunately, the property on three sides of that used for the building was vacant and there was an abundance of space that could be utilized for storage. The layout of the construction plant was comparatively easy. On the north side, three material hoists and a concrete plant were located. In the center, at the elevator shafts, two tile hoists were erected, and on the south side four material hoists and a concrete plant were placed. The contractor's office, blacksmith shops and several sheds were built on the west side. Some

(*Continued on page* 36)



Three views, showing various stages of construction on the American Furniture Mart building, in Chicago, the largest multi-story building in the world. Sixteen stories high, it has over one and one-half million square feet of floor area.

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Making a Huge Turbine Casting

By B. S. Havens

TIME was, and that well within the memory of the foundrymen of today, when pouring fifty tons of metal was a good week's production for a foundry. Recently the iron foundry at the Schenectady plant of the General Electric Company handled fifty-five tons of molten iron in pouring a single casting in one afternoon. Two melting furnaces, or "cupolas," were kept busy for three hours in order to provide sufficient metal.

The casting was for the lower exhaust hood of a 40,000 kilowatt steam turbine. It required three weeks and about two hundred tons to make the mold for this casting.

The mold was made in a pit about 10 feet deep, 17 feet wide and 26 feet long. Four 20-inch I-beams were bolted to channel irons on the sides of the pit to hold the mold together, and eight tons of iron weights were placed on each "runner box."

After about three hours of melting and tapping, three ladles, two of 15 tons capacity and one of 30 tons, contained enough metal to pour the mammoth casting.

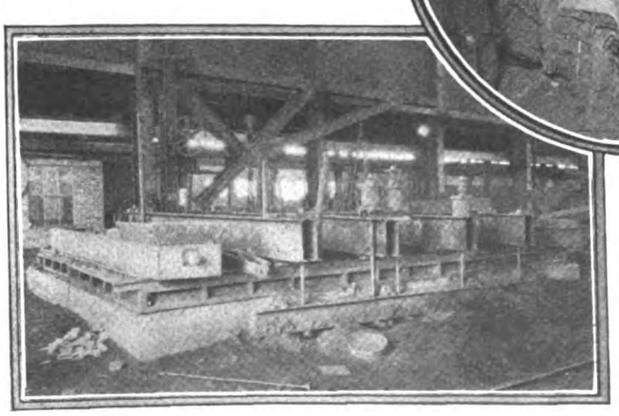


Fig. 1. The mold after it was finally prepared, now ready for the pouring. The heavy I-beams for holding the mold together during the pouring are shown. In the left foreground is one of the three "runner boxes" which receive the molten metal. 200 tons of sand were used to make this mold.

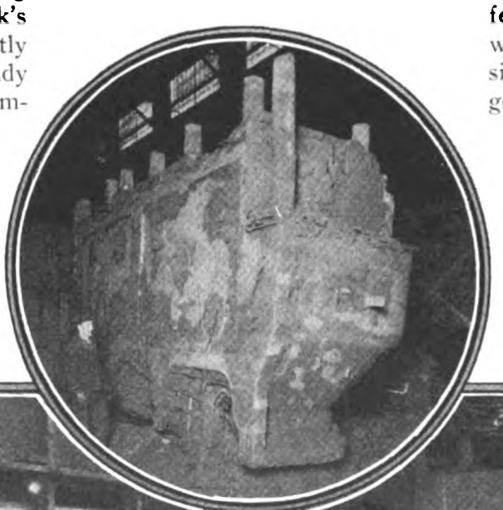


Fig. 2. The casting immediately after being removed from the mold. This removal took place a week after pouring, as sufficient time must be allowed for complete cooling. The casting must now go through a thorough cleaning before it can leave the foundry.



Fig. 3. The finished casting, ready to go to the machine shop. The foremen who handled the job are shown to give an idea of the casting's size. The shrink heads on the top have yet to be knocked off. They weighed 190 lbs. each.

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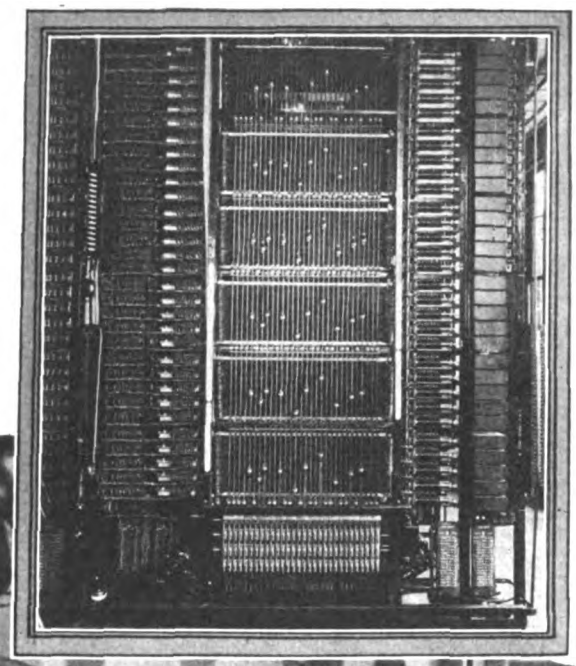
What Machine Switching Does for the Telephone Service

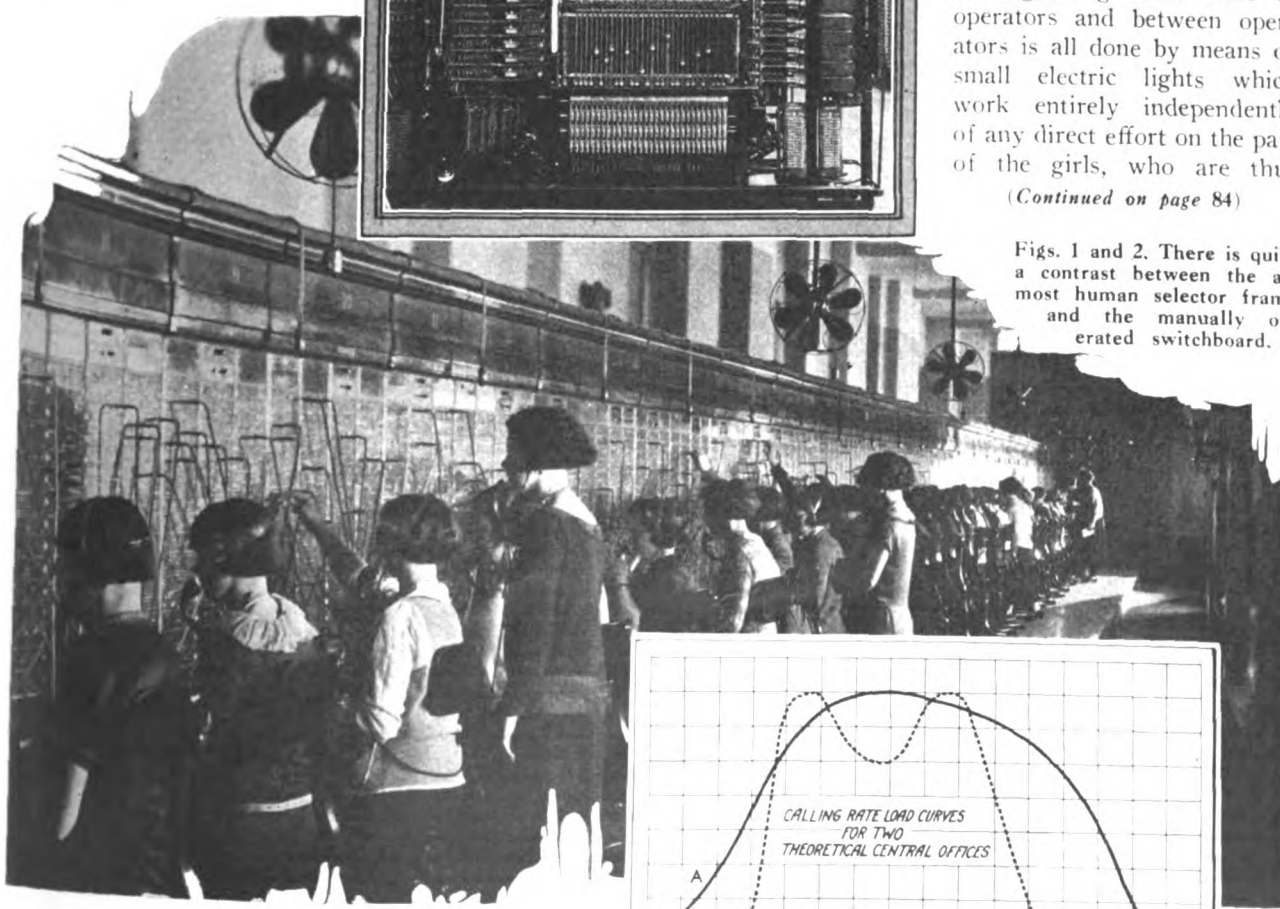
By Francis A. Westbrook

IN New York City and other places the telephone service is gradually being changed over from manual operation to "machine switching." That is, instead of telephone calls being completed by one or more operators, "telephone girls," they are, in some exchange districts, being completed by automatic electric machinery when the telephone user himself "dials" a number. Mention was just made that with "manual operation" it took one or more girls to complete a call; the fact is that out of the seven million three hundred thousand (7,300,000) local calls made daily in Greater New York, eighty per cent. require two operators to complete them. There are now about 20,000 girls employed in the Traffic Department exclusive of those needed for long distance toll calls. Consequently any means which can be employed to decrease the human element in rendering telephone service is bound to be of benefit in one way or another.

In fact, since the very beginning of the development of telephone service, improvements have been going on which have lightened the human burden. It would otherwise be impossible to operate the system at the present time. One of these improvements is that in most cases the girls do not have to do the ringing. That is started automatically when the connection is established and stopped automatically when the called party lifts off his receiver; another improvement is that the signalling from users to operators and between operators is all done by means of small electric lights which work entirely independently of any direct effort on the part of the girls, who are thus

(*Continued on page 84*)





Figs. 1 and 2. There is quite a contrast between the almost human selector frame and the manually operated switchboard.

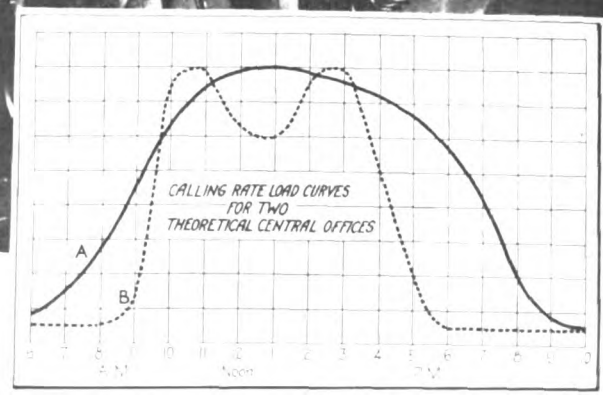


Fig 3. At the right—Calling rate load curve for two typical telephone exchanges. "A" represents a residential district, and "B" a business district.

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Scientific Management in Dull Times

By John Morgan

Chairman of the Board, The Rider-Ericson Engine Corporation

THE recent period of business depression following a few years of unprecedented prosperity has taught many of us that the so-called modern business executive was weighed in the balance, and many were found wanting. In fact, many of us have wondered in the past few years which of the so-thought scientifically managed large industries would be the next one to call for a receiver, or the banker to revamp their financial structure. However, thanks to some act or perhaps to real scientific management, the majority of all the industrials have pulled through the crisis and are now on the uphill road to normal return of business, and normal return on investments.

It is to be expected that many will tell of "How we won the war," but with the idea of a real scientific investigation, let us carefully consider some of the more pronounced methods or plans that have assisted many in the modern conduct of industrial business during the dull or slack periods of industry.

The average executive who lacks a real insight into his business usually escapes the watchdogs of the treasury for the first few months of the

GENERAL BUDGET ACCOUNT

Inter Loss in Red
" Gain in Black

Est. Sales $ 220.000.00
% of Sales 99.1%

Month or Year	Account Symbol	1924	Jan		Feb		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.	
Est Monthly % of Total Sales		100	5.7%		4.5%		7.3%		12.2%		10.2%		8.9%		11.1%		9.6%		10.6%		11.8%	
			Loss.	Gain	Loss.	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain	Loss	Gain
General Overhead Accounts	1G																					
Salaries + Gen. Clerical	2G	13800	1150		1150		1150		1150		1150		1150		1150		1150		1150		1150	
Int. on Bonded Dept.	3G	9420	785		785		785		785		785		785		785		785		785		785	
Int. on Investment	4G	28380	2365		2365		2365		2365		2365		2365		2365		2365		2365		2365	
Insurance	5G	3600	300		300		300		300		300		300		300		300		300		300	
Taxes	6G	1200	100		100		100		100		100		100		100		100		100		100	
Repairs	7G	3000	250		250		250		250		250		250		250		250		250		250	
Rentals	8G	1350	112		112		112		113		113		113		112		113		112		113	
Light + Heat	9G	50	4		4		4		4		4		4		5		4		4		4	
Telephone + Telegraph	10G	360	30		30		30		30		30		30		30		30		30		30	
Supplies	11G	150	12		12		12		12		12		12		13		13		13		13	
Accounting Dept.	12G	3120	260		260		260		260		260		260		260		260		260		260	
Misc.	13G	100	8		8		8		8		8		8		8		8		9		9	
Total General Overhead	14G	65440	5453		5453		5453		5452		5453		5453		5453		5453		5453		5453	
Factory Department	1F																					
Salaries	2F	16224	1352		1352		1352		1352		1352		1352		1352		1352		1352		1352	
Eng. Dept.	3F	1300	108		108		108		108		109		109		108		108		109		109	
Shipping Dept. Mail	4F	500	40		40		40		44		44		44		44		40		42		44	
Telephone + Telegraph	5F	360	30		30		30		30		30		30		30		30		30		30	
Painting Matl.	6F	300	20		20		20		25		25		30		30		30		30		30	
Printing + Blue Prints	7F	360	30		30		30		30		30		30		30		30		30		30	
Power	8F	2000	120		120		220		220		220		220		220		220		200		180	
Heat	9F	750	125		125		125		125		—		—		—		—		—		—	
Water	10F	100	8		9		8		9		8		8		9		9		8		8	
Sta. Supplies + Stamps	11F	500	44		44		44		40		40		40		40		40		44		44	
Iron Sand Coke	12F	28150	2346		2346		2346		2346		2346		2346		2346		2346		2346		2346	
Other Purchased Matl.	13F	35000	2000		1800		2500		4000		3500		3000		3800		3500		3500		3800	
Factory Labor	14F	780	65		65		65		65		65		65		65		65		65		65	
Shop Labor	15F	30000	2000		2000		2000		3000		3000		3000		3000		3000		3000		2000	
Foundry Labor	16F	15650	1305		1305		1305		1305		1305		1305		1305		1305		1305		1305	
Misc.	17F	100	8		8		8		8		9		9		9		9		8		8	
Total Factory Acct.	18F	132074																				
Sales Account	1S																					
Salaries	2S	11740	980		980		980		980		980		980		980		980		980		980	
Clerical Help	3S	3796	316		316		316		316		316		316		316		316		316		316	
R.R. Expenses	4S	500	42		43		42		43		42		43		42		43		42		43	
Rentals	5S	1350	112		113		112		113		112		113		112		113		112		113	
Telephone + Telegraph	6S	360	30		30		30		30		30		30		30		30		30		30	
Light + Heat	7S	300	25		25		25		25		25		25		25		25		25		25	
Stamps + Supplies	8S	520	43		43		43		44		44		44		44		43		43		43	
Direct Advertising	9S	2020	240		240		240		100		100		100		100		100		100		240	
Indirect -	10S	200	100		100		—		—		—		—		—		—		—		—	
Misc.	11S	150																				
Total Sales Acct	12S	20936																				
Total Est Budget		218450																				

Fig. 1. A general budget account form, as discussed in the text.

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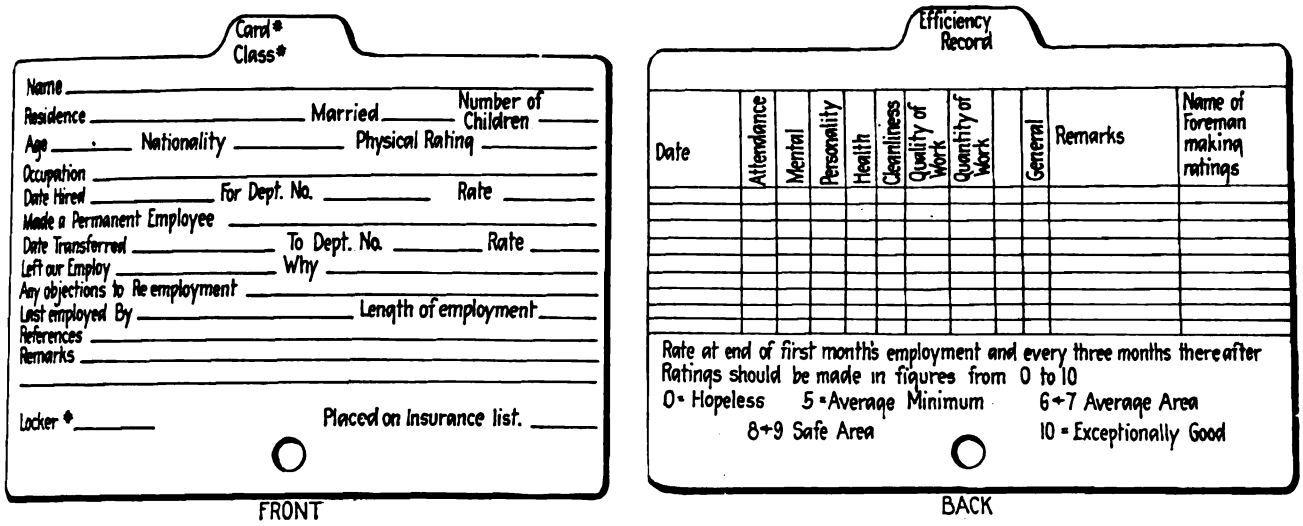


Fig. 2. Card forms such as the above—the reverse side for ratings—make easier the task of weeding out the inefficient worker.

slack period by saying, "Oh, this is a temporary affair, all of us must expect a falling off at this particular time." He amplifies this with a number of good excuses like the weather and many other like remarks, but sooner or later the directors harken to the voice of the treasury, and then the frenzied cries of "Retrenchment" and "Economy" are heard, throughout the entire organization.

Unless the General Manager has a real knowledge of the business, and is fortified by charts and curves, and what is more important still, a real insight into human nature, he is liable to economize in a wrong direction and in a manner that will be felt keenly when business does resume its normal balance.

It is a problem of no mean importance to decide which economies or retrenchments should come first. The proper method is to prepare a list of the more important ones and take same up with the various department heads, as to their ideas on the subject. When this has been done, it is still up to the general manager to make his own decision for, after all, most department heads are all for retrenchment and economy in every department except their own.

In general, it will be found that the first economy is that of "Weeding out the inefficient or surplus employees." Unless the industry has been scientifically managed, this will not be an easy task for it does cost real money to indiscriminately hire and fire employees.

If the industry in question has a proper method of employee classification with a rating card attached, it is quite an easy manner to let go those whose general rating is down. Unless such a system is in vogue, the only other way to cut out wasteful or excess labor is on the say so of the department heads.

The next step in any sound retrenchment and economy program involves the Stores Department, in that this department governs the carrying of small stocks yet sufficient for the demand; that of turning the inventory into cash and the conservativeness of the purchasing program.

Before considering the above, let us first take up what a modern Stores Department does for any factory in the form of cutting costs. It first of all should be so planned and laid out that it uses the maximum space for the maximum capacity.

To illustrate, I recall one store room whose space was limited as to cubical contents to 10 x 50 x 16 x 8,000 cubic feet; they needed more storage space. A survey of the plan showed that they had four racks with three foot aisles. These four racks had a storage capacity of 3,500 cubic feet, with aisle space of 4,500 cubic feet. These racks were then rebuilt into three racks with three foot aisles, and the racks then had a storage capacity of 5,000 cubic feet, or in other words, the storage capacity was enlarged 1,500 cubic feet, with no decrease in the width of the aisle, nor did it make for more difficult access of the stores.

By proper storing and keeping of proper records, it cuts down the excessive depreciation of stock, and makes position a better cost system, as well as guarding against pilfering and provides the necessary figures for a careful check on the consumption of raw and finished material, and furnishes an up-to-the-

(*Continued on page* 46)

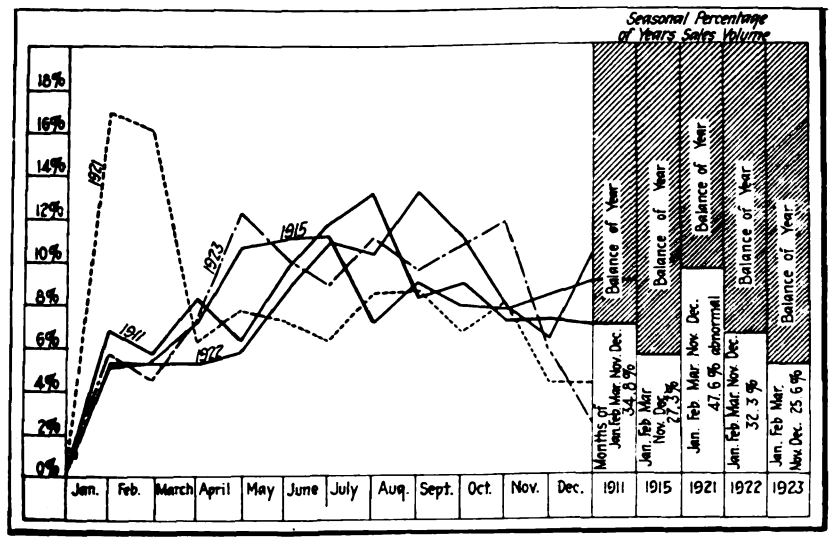


Fig. 3. The first essential factor toward greater sales effort is an accurate charting of sales, over a period of years, by months.

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The Merit System of Education

A Plan Which Benefits Employer and Employe

By Garrett Burgess
Vice-President, N. A. S. E.

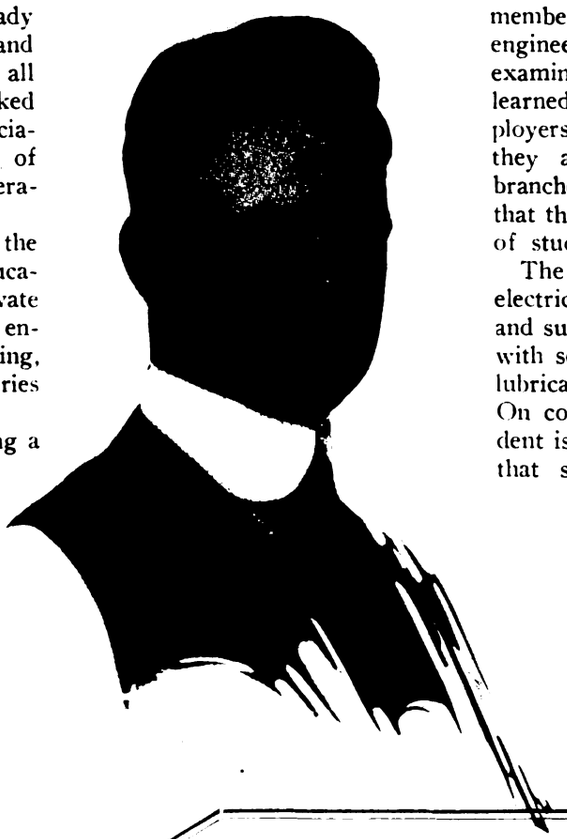
A PLAN that in one year's time has made better engineers of about sixty experienced men, some of whom have for years been leaders in their field, that is now training some 300 others, that is already saving large sums in industry, and that has brought inquiries from all over the country, has been worked out by the Michigan State Association of the National Association of Stationary Engineers and is in operation in this state.

The plan, commonly known as the Michigan Merit System of Education, is primarily intended to elevate the standards of the stationary engineering profession, and in so doing, to benefit members and the industries in which they are engaged.

It is generally agreed that being a licensed stationary engineer doesn't mean a great deal. License laws of different cities and states are not uniform, they usually cover boiler room and engine room operation only, they provide no incentive for advancement, they are sometimes poorly administered, and they fail to rate licensees according to their training, experience and ability. Furthermore, a general survey of the cities and states where license laws are in effect and of others where no such laws are provided, fails to reveal any higher standard prevailing where there are such laws than where no license laws are in effect.

The result is that many who become licensed engineers are proficient in only one branch of their profession and never make any further progress. The standard of efficiency in the plants of the country is only about 50 per cent. Employers are seeking steam engineers, electrical engineers, combustion engineers, and refrigeration engineers instead of one thoroughly capable engineer to supervise all these departments of their plants, and the existing conditions generally are unsatisfactory, both to the engineers and to those who employ them.

It was after making a thorough study of conditions, with particular reference to license laws and the failure of members to advance in their profession, that the Michigan State Association of the N. A. S. E. determined to undertake such a project as the Merit System for the purpose of solving the engineering problems within its boundaries.



GARRETT BURGESS entered the employ of Morgan and Wright some eighteen years ago as a lad, engaged in common labor. Practically all his training was obtained through experience and home study under the direction of a correspondence school, which accounts, in part, for his interest in promoting the cause of home study among other engineers.

He was president of the Michigan Association of the N. A. S. E. in 1923 and is now vice-president of the national association.

He is now power engineer of the Morgan and Wright plant, Detroit, and consulting engineer of the United States Rubber Company, Tire Division.

Conducts Schools

The plan is, briefly, to encourage members to pursue further studies in engineering, to direct their study, to examine them on what they have learned, and to certify to their employers or prospective employers that they are qualified in the specific branches of stationary engineering that they have covered in this course of study.

The complete course covers steam, electrical, combustion, refrigeration, and supervising engineering, together with several special subjects such as lubrication or "practical" engineering. On completing one subject, the student is given a certificate of merit in that subject; on completing other subjects, these are merely written in on his original certificate.

Anyone who has been a member of the N. A. S. E. for one year, who has had at least five years' experience, and who has enrolled in the state course, is eligible to make application for examination. Everyone who is granted a certificate of merit must have covered the course, however, regardless of his previous training, experience, or positions held.

The work is under the direction of an educational department, which consists of the state president, state vice-president, and six members, three of whom are chosen by the president and three by the vice-president. The state is divided into two districts and the president appoints a chief examiner and four associate examiners for one

(*Continued on page* 78)

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Why Pay the High Cost of Dirty Windows

When Skybryte Cleans Them Perfectly for a Fraction of a Cent Per Foot

AND any ordinary laborer can do the work! He simply coats the glass with Skybryte. Almost immediately the hardest crust of rust, grease and soot is dissolved. Then he flushes off with water, using either hose or brush. That's all! The glass is like new. Daylight floods your plant. Up jumps production. Spoilage is lessened. Accidents are minimized.

Injures Dirt Alone

Unlike cheaper, but dangerous chemical compounds, Skybryte never injures paint, putty or sash. That's why all types of industrial concerns which have experimented with all methods of cleaning now use Skybryte exclusively.

Most Economical of All Cleaning Methods

In every section of the country, users frankly state that Skybryte is the most economical and satisfactory means of cleaning dirty glass.

Five gallons clean 4,000 square feet of dirty glass. An unskilled laborer cleans 5,000 square feet per day. The average cost, including both labor and material is only a fraction of a cent per square foot.

Make This Test At Our Risk

We'll prove our claims for Skybryte by actual demonstration. The coupon below explains our trial offer. Take advantage of this now. Begin at once to cash-in on the advantages of daylight and the economy of Skybryte.

The SKYBRYTE Company
11th Floor · Keith Bldg. · Cleveland, Ohio
Chicago Branch: Tower Bldg., 6 North Michigan Ave.

Skybryte
CLEANER (LIQUID)

For Plain Transparent Glass Use Skybryte Powder. Free sample on request.

TRIAL OFFER COUPON

The SKYBRYTE *Company,*
Keith Building, Cleveland, Ohio

You may ship us five gallons of Skybryte on trial and one regular 75c Skybryte brush FREE. We will use one gallon of Skybryte at your risk. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for five gallons Skybryte at $3.00 per gallon, F. O. B. Cleveland.

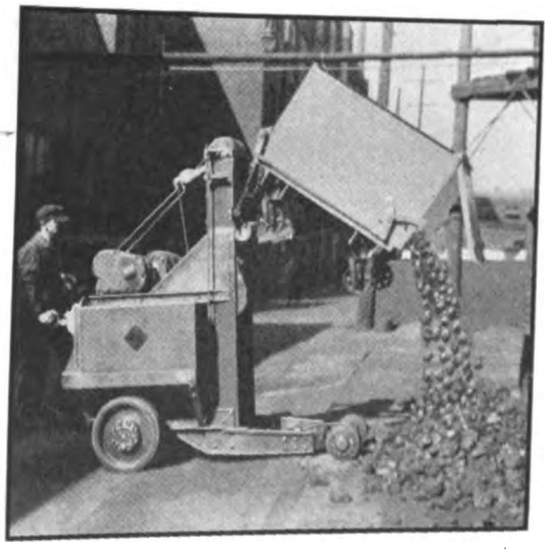
Skybryte in bbls. $2.50 per gallon freight allowed.

Company .....

Street .....

City .....

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Great Loads *of* Bulky Materials

are picked up, transported, elevated and dumped into hoppers, bins or cars.

The New HI-LO Tructor

with tilting platform is a combination crane, elevator and conveyor which delivers anywhere on the premises.

One to three cubic yards or 2000 to 6000 pounds of material in separate bodies at loading point is handled electrically at a fraction of the usual cost.

Great strength, long life and the quick saving of cost recommends it for handling coal, ashes, castings, sand, chips, chemicals, rubber and the like.

This husky machine is one of twenty different types all backed by eighteen years of electric industrial haulage experience.

Request Bulletin 32



The ELWELL-PARKER ELECTRIC COMPANY

Cleveland Ohio

The World's Largest Multi-Story Building

(*Continued from page 29*)

of the material had to be bought considerably in advance of its use to insure delivery, but large quantities of cement, lumber, sand and gravel were purchased and delivered to the job as needed.

Because of the huge size of the structure, two concreting plants were required, placed on opposite sides of the building. The charging floors were at ground level, and cement was stored under a roof extending from the overhead aggregate bins. Tarpaulins hung from the roof afforded ample shelter for the cement. Each plant was capable of delivering 450 cubic yards of concrete a day or enough to finish one floor a week. As most of the concrete was placed during the winter of 1923-24, many precautions were taken against freezing. Before the materials were placed in the mixer they were thoroughly heated so that when the concrete reached the forms it was still warm. Enough salamanders were used to insure a favorable temperature, even in the coldest weather. Large tarpaulins were also used to protect the green concrete.

The pan floor type of construction was used throughout and 600,000 lineal feet of 2-foot steel floor domes were required. Special steel girder forms were used on the entire sixteen floors. As soon as one floor was completed they were moved up to the next one. By this process the steel forms were used a number of times and a considerable saving resulted. In the basement one row of columns was omitted, and 745 tons of structural steel girders used to carry the load of the upper floors.

The following list of materials gives a good idea of the size of the job:

100,000	barrels of cement
50,000	cubic yards of crushed stone and gravel
35,000	cubic yards of sand
7,300	wood piles in the foundations
745	tons of structural steel (used in the basement)
6,600	tons of reinforcing steel
3,000,000	board feet of lumber for the forms
1,000,000	pressed brick
6,000,000	common brick
400,000	square feet of tile partitions
3,600,000	square feet of plastering
1,800	tons of terra cotta
600,000	lineal feet of 2-foot steel floor pans
1,500	windows

In the Mart are one and one-quarter miles of marble corridors and 600 units of exhibition space. Lining the corridors on either side are large display rooms fronted with big plate glass windows. The show rooms, and, in fact, the entire structure, has a complete indirect lighting system. As a safety precaution, a sprinkler system was installed. In accordance with modern building practice each floor will be equipped with drinking fountains, mail chutes, ample toilet facilities and hot and cold water in the washrooms. Six high speed elevators will serve crowds that come twice a year for the spring and fall buying seasons.

The first two floors will be devoted to the American

(*Continued on page 38*)

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Materials Handling FORUM.

Conducted by Matthew W. Potts

Question No. 28.

"We have a handling problem in connection with the packing of bulk materials. We are using an automatic carton forming and sealing machine which automatically weighs and packs the material.

"With this automatic packing machine it is necessary to maintain a certain volume of the material in a hopper above the machine feed point. Formerly this hopper was filled by manual labor from the floor above, but in our new building we plan to feed this small storage hopper by an elevator and screw conveyor from a floor below. With this new arrangement, it will be necessary to have an automatic cut off and starting device so as to keep the bin filled.

"In this connection can you give us some simple idea or arrangement for accomplishing the results we desire."

* * *

Answer:

Your problem is one that has been solved in many ways and a number of manufacturers* build devices of this character. Since you have asked for an idea, we present the enclosed sketch showing a device which we recently saw installed for practically an identical condition to that stated in your letter. With this device, the material is fed into the top by screw conveyor and as it falls to the bottom of the hopper, the material rests on the hinge shutter which is counterweighted. The counterweight is adjustable so as to regulate the pressure required to throw the electric switch. The electric switch is wired into the elevator and conveyor motor, and starts and stops it depending on the position of the shutter. With this arrangement a constant supply can be maintained.

* * *

Question No. 31.

"In the near future I am going to write some articles on materials handling and it would be of great assistance to me if you would be kind enough to pass an inquiry to American manufacturers of materials handling equipment to mail me their latest catalogs on their products.

"I do not hesitate to say that your magazine is of very great interest and assistance to me in my work, and that in my opinion every industrial executive and every man in industry should read INDUSTRY ILLUSTRATED."

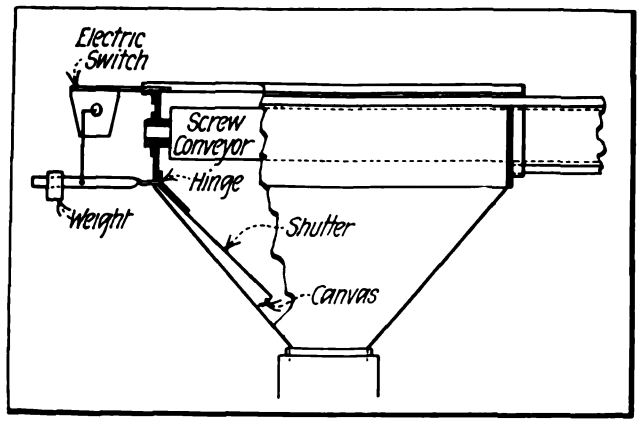
BJARNE COLBJÖRNSEN
Ass. Superintendent Stockholms Superfosfat Fabriks Aktiebolag, Fabriken Cäddviken
Stockholm, Sweden.

*Manufacturers' names can be obtained by Forum readers on request.

This Forum provides a place for the discussion of materials handling problems of general interest.

Each question published will be answered on the basis of our experience and available information. Further discussion of these problems will be welcome, and we will publish such letters as, in our estimation, contribute to a clearer understanding.

The foregoing letter is evidence that materials handling is also gaining an important position in the executives' minds of foreign lands. For many years, Germany and England have been far in advance of other countries in the use of this type of equipment, but today the United States of America seems to be the source of new ideas, types of equipment and engineering data.



Automatic starting and cut-off device for elevator and conveyor feed (Question 28).

Possibly the manufacturers of this type of equipment are not interested in export business, but the opportunity of a future market in foreign lands should not be overlooked. The Forum therefore requests all manufacturers interested to forward their catalogs direct to Mr. Bjarne Colbjörnsen.

* * *

Question No. 22, published in the Forum for November, 1924, discussed the subject of storing coal to eliminate spontaneous combustion. The discussion was quite lengthy, but the Forum is in receipt of the following communication which adds more to the information already published:

* * *

"I was very much interested in a discussion in the Materials Handling Forum of INDUSTRY ILLUSTRATED for November.

"Your comment that 'any or all of the precautions suggested by the U. S. Bureau of Mines with regard to safe storage of bituminous coal to avoid spontaneous combustion may be impractical' is certainly well taken.

"I was particularly interested in the method used by the Philadelphia Electric Company,—the rolling process.

"The latter method, of course, is also not practical where coal is stored on a smaller scale. May I, therefore, make a few comments from my own experience?

"Spontaneous combustion is, of course, slow combustion, caused by gradual oxidation of the coal under conditions where the heat is not carried away as fast as it is generated. These conditions always exist in large coal piles.

"Combustion of coal, of course, requires air. The method of storing used by the Philadelphia Electric Co. aims to exclude air from the pile, or to reduce it to a point where it is insufficient to support combustion.

"Many authorities contend with good reason that a surplus of air supplied to the coal pile will ventilate the pile and conduct away the heat of oxidation as fast as it is generated. Personally, I believe this practice is dangerous. There is no way of determining when the air supplied is sufficient to accomplish the purpose. Poorly or unintelligently regulated ventilation of coal piles may accelerate combustion and make conditions worse than no ventilation.

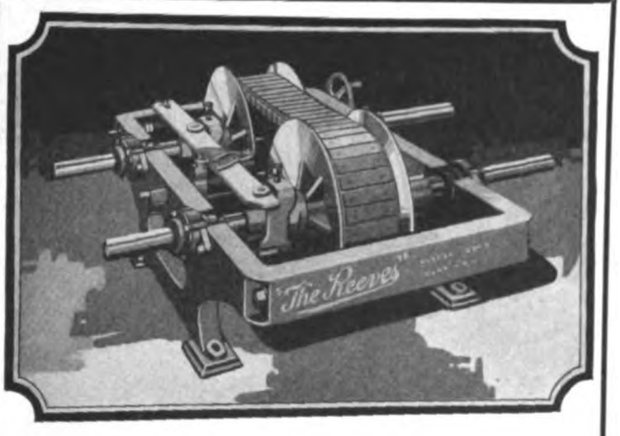
"For these reasons, therefore, I favor the Philadelphia method where it is practical. Otherwise, let the pile alone. Do not work it and do not water it, unless for the purpose of reaching and quenching an actual fire.

"Spontaneous combustion, or rather conditions favorable to spontaneous combustion, is greatest when the greatest amount of coal surface is exposed to air and when the spaces or voids between the lumps of coal are the greatest in volume. These conditions are maximum in the smaller sizes of coal and minimum in the large sizes. This is a potent argument for letting the coal pile alone. Continuous working of the pile breaks up the lumps. Alternate wetting and drying has the same effect.

"I do favor strongly one of the sug-

(*Continued on page* 38)

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Here's Our Star Salesman

"The Reeves" Variable Speed TRANSMISSION

Since 1896, "THE REEVES" Variable Speed Transmission, itself, has been our star salesman. Over 25,000 are now in daily use, every one sold on its own merit—every one bought because it will do its work better than any other method of variable speed control.

"THE REEVES" Transmission is easy to install—simple to operate—pays for itself in a short time. Many have been in steady, 24-hour service for 20 to 25 years. It will save you money and improve production. Consult with our Engineering Department. Write for copy of Engineers' Handbook L-57.

REEVES PULLEY COMPANY
Established 1887
Columbus, Indiana
Detroit Branch: 135 High St. West
Reeves-Bond Sales Co., 39 So. Clinton St., Chicago

Repeat Orders of One Company

The J. H. Day Company, Cincinnati, O., a leading manufacturer of baking machinery, have been incorporating "THE REEVES" Transmissions as standard equipment since 1905. They have found "THE REEVES" Transmission to be the most accurate, economical and dependable means of variable speed control.



When writing advertisers please mention Industry Illustrated

Materials Handling Forum

(*Continued from page* 37)

gestions offered by the U. S. Bureau of Mines, namely, that of storing the coal in smaller individual piles rather than in one large pile. In coal bunkers this is accomplished by partitioning the bunker. The same principle should be applied to outside storage. This method serves to isolate a fire and prevent its spreading to the entire storage pile.

"One very important point has not been brought out in this discussion, namely, the value of temperature records, carefully taken and systematically kept. Warm spots in a coal pile are thus often detected even before the coal has begun to burn. The pile affected can then be turned over and a fire prevented. Coal from this pile can then be used first.

"The best method I know of for taking these temperature records is as follows:

"Insert long iron pipes, with the bottom ends capped to prevent ventilation and 'chimney effect,' into each pile of coal at several points not too far apart. Assign a letter of the alphabet to each coal pile and number the pipes. The symbol A-1, for example, would refer to pipe No. 1 in pile 'A.'

"Make up a chart to correspond to this system. Take temperature readings by lowering a thermometer into these pipes at least once a week. Record the temperatures on the chart. An increase in temperatures taken in any given pipe indicates the possibility of spontaneous combustion."

The World's Largest Multi-Story Building

(*Continued from page* 36)

Exposition Palace, which is a project entirely separated from the permanent furniture displays. It will provide, at a profit, accommodations for various expositions, such as the Automobile Show, the Food Show, etc. The main entrance will be through a spacious marble lobby, fronting on Lake Shore Drive. On the first floor will be 250 booths, ten feet square, open on two sides. On the second floor will be Better Homes exhibits.

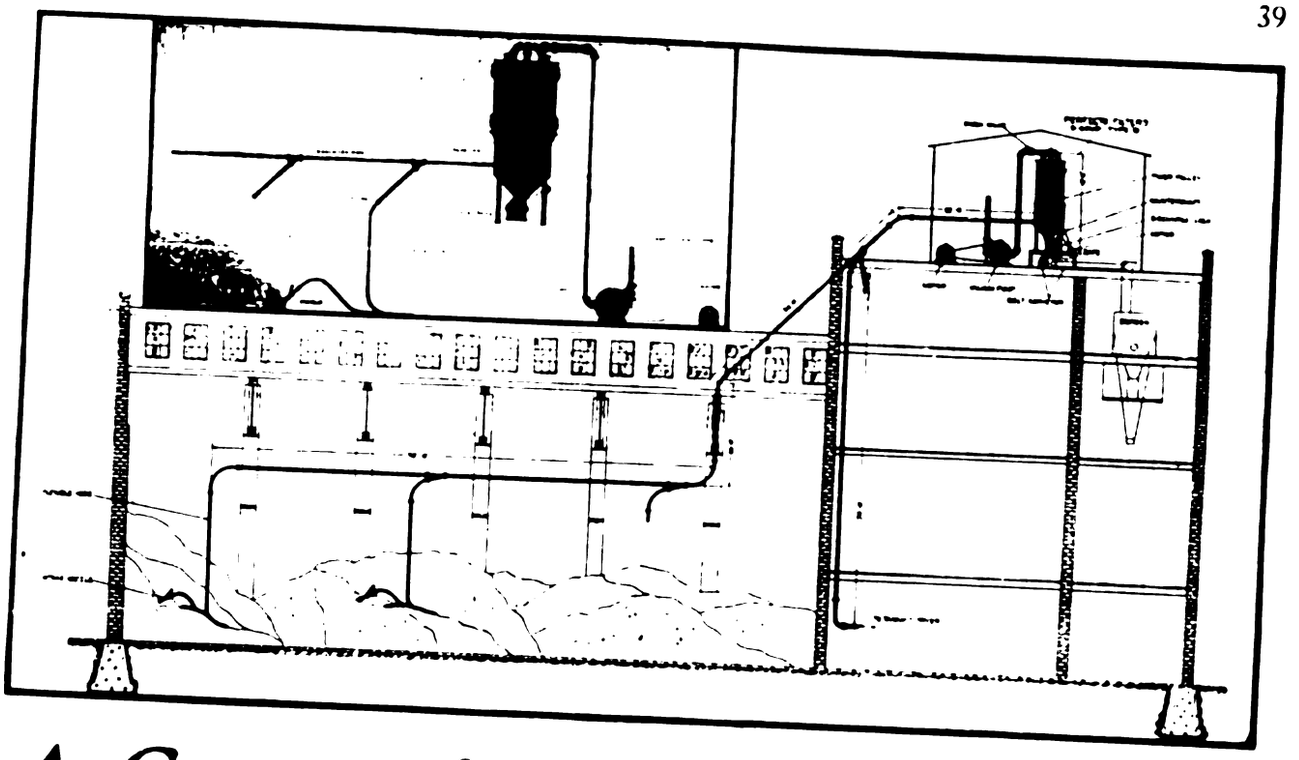
A comparison of the Mart to other large buildings gives a good idea of its size. The General Motors building in Detroit, built of structural steel with reinforced concrete floors and faced with Bedford limestone, is fifteen stories high and has a total floor area, including the laboratory, of 1,321,000 square feet.

The largest unit of the Sears Roebuck buildings in Philadelphia has a floor area of 1,258,000 square feet.

The 40-story Equitable Building in New York covers a ground area of 48,000 square feet and has a floor area of approximately 1,200,000 square feet.

The Army Supply Base building, built in Boston during the war, is a reinforced concrete structure 126 feet wide and 1,628 feet long. It is eight stories in height and has a floor area of 1,651,100 square feet. This structure was built in six sections and each section is separated from the next by a continuous wall. Although the supply base appears to be a single unit, it is really six units placed close together and joined by one roof.

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A Conveying System that is 100% Efficient—

DRACCO Pneumatic Conveying SYSTEM

Efficient not only because it saves labor, health and conserves valuable space, but also because every particle of the material is conveyed. Not one speck of the finest dust is lost.

That's why there are so many DRACCO Pneumatic Conveying Systems used for conveying fertilizer material, such as bone dust, dried blood and phosphates and for lithophone and other finely powdered materials where the saving of every particle is required.

DRACCO Engineers have designed and developed conveying systems for handling the heaviest as well as the lightest dry materials. They have a back-ground of years of experience behind them specializing in Pneumatic Conveying and Dust Collecting, as well as Fume Recovery.

We have a number of booklets describing the various types of installations. Write telling us your particular problem.

DRACCO DOES IT

THE DUST RECOVERING & CONVEYING CO.

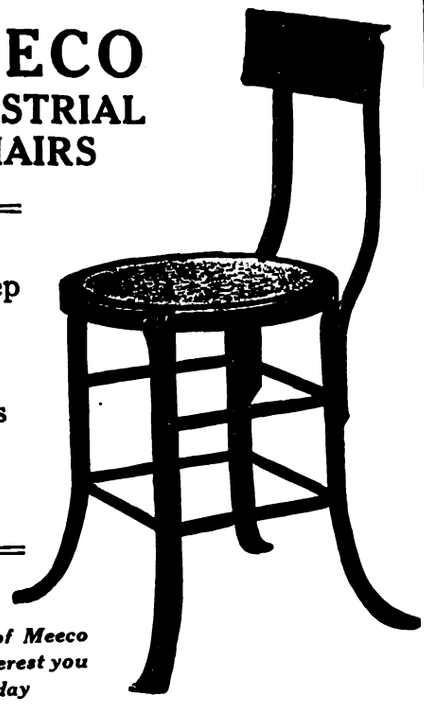
Engineers and Manufacturers, Cleveland, Ohio.

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MEECO
INDUSTRIAL CHAIRS

Durability
Low up-keep
Comfort
Angle-iron frame
Rigid rungs
Wood seat
Snug back
Low price



The low cost of Meeco Chairs will interest you Write today

MFG. EQUIPMENT & ENG. CO.
FRAMINGHAM, MASS.

Shelving, Bins, Boxes, Lockers, Benches, Fountians, Bowls

LAY Metal Case BROOMS



There's just as big a difference in brooms as there is in men—some "wear well", others don't.

Lay Metal Case Brooms are built for heavy work and do it long after they've paid for themselves.

The extra broad flexible sweeping tip gets into the difficult corners and out comes the dirt.

There's a Lay Broom for each type of floor and every industrial use. Send for descriptive price list.

"Hold their Shape till Worn to the Last Stub"

In Lay Brooms, the fibres are held as in a vise by machine-clinched staples, not nails. They don't shed or spread—last twice as long as ordinary brooms.

THE JOSEPH LAY COMPANY
120 College St., RIDGEVILLE, IND.
NEW YORK OFFICE: 110 W. 34th St.

Management and Diet

(*Continued from page* 25)

premises. Dishes are washed by machinery and it requires a staff of only seventy-five persons to operate this eating place.

A surprisingly extensive menu is offered in these free cafeterias. One of the biggest offers forty-five items, including six salads, four meat entrees and several deserts. The food is of the best quality and prepared with infinite care. Above all, it is fresh and pure.

Many employers of labor find that the cheap lunchrooms that surround their plants are not suitable for the employes and that what they are apt to get to eat not only is far from nourishing, but there is apt to be some profiteering. This led many of them to start cafeterias in self defense.

But the early beginnings of industrial feeding go beyond that evil. Whatever may be the evils of the average cheap "beanery," the evils of the old fashioned dinner pail are worse. Also, the dinner pail system results in the scattering of refuse about the property. A Chicago employer of labor had the contents of forty-eight dinner pails examined last year and the next day bought a cafeteria outfit. The food combinations brought from home were food for thought—not for stomachs.

Most of the big industrial cafeterias have a cheerful atmosphere and are equipped with rest and recreation rooms for both sexes, where magazines and books may be made use of or where games may be played between eating time and the ring of the bell.

In many of these cafeterias, you will find the executives and officials eating the same food as the employes. Most of the banks have private rooms for department heads and officials where they can talk business as they eat lunch. But they get the same food as the clerks. They get table service instead of cafeteria service.

The extensive "chain" of cafeterias operated by the various divisions of the Bell Telephone System, North, South, East and West, for the benefit and protection of their employes, is an interesting sidelight on the industry.

Constant additions have been made to this lengthy chain and few of the larger exchanges are now without a modern lunch room for operators.

They contain the latest devices and appliances for rapid and wholesome food service, expert directors, experienced in food control and form an increasingly important part of employe betterment work.

In New York City, the New York Telephone Company has gone extensively into employe lunchrooms, and great strides have been made by the Southwestern Bell Company in their Texas and southwestern exchanges.

Cafeterias are lined up with rest rooms, hospitals and recreational departments in the big cities and while they are operated at a slight loss to the company, it is admitted that this is more apparent than real for the reason that the cafeterias have greatly reduced labor turn over.

Every exchange in New York of any importance now has its cafeteria. This also is true in Philadelphia. The rooms are fully sanitary and airy, well lighted and pleasant. There is no crowding or hurrying. Meals are sold at surprisingly low prices.

The cafeteria or self service system has been applied in most cases, as it reduces cost of food service and

(*Continued on page* 42)

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THERE'S a Grinnell Pipe Hanger for every purpose — every structural condition. They can now be bought by anyone. Our 78-page Pipe Hanger Catalog puts 40 years' practical experience into usable shape for you. Send for it today.



GRINNELL *Adjustable* PIPE HANGERS

It wasn't to dodge the Income Tax

"MY telegram from Nashville was purposely ambiguous," said the President, as cigars were lighted. "I wanted all you men on the Board of Directors to dine with me the day I got back, but I decided to keep you guessing."

"He's found some way to evade the income tax, that's my guess," laughed one of the members.

"Not at all. But from now on I am going to comply with one law which most people are ingenious at evading. And I am prepared to prove that the penalty of evasion is enormous."

"Sounds like an argument against Tennessee moonshine," laughed another.

"I'm against an old moonshine idea in business—the idea that a buyer can get the best of it by pitting his trading ability against low bidders. With our new building expansion program a decision is called for. When we're in the market for any highly technical product, buying it at the lowest possible price is expensive. Is this Company to stand the expense?

"But we can't complain about our new Tennessee plant," cut in one of the senior members.

"No, and I'll explain why. You know how I went down there expecting to see a half finished plant; how I found it practically ready to start—three months ahead of the date our own Company engineers had estimated as possible. Instead of our $1,000,000 being tied up in non-productive building operations, that three months meant $50,000 profit we didn't expect this year.

"I got right hold of the Consulting Engineer and asked him how long he had been a miracle worker.

"'I'm not the miracle worker—you did it,' said he. 'You let me select the contractors, supposing, of course, I would accept the low bids. But I didn't. I took one of the higher bids—$5,000 higher.'"

A ripple of laughter went round the table.

"You needn't laugh. The $5,000 saved the $50,000! Usually the piping systems, sprinklers, heating, power and process piping are bought more strictly on price than anything else. Generally they are the last things to get done, although they are the most important from an operating standpoint. In this case one contractor got them all. Within two days after the contract was let he had two men on the job checking the plans against actual conditions.

"He had to make certain things in his own plants. He had the facilities for making them quickly and right. Certain items he had to buy outside. His price to us allowed him to buy good stuff quickly at fair market prices. He didn't have to hold up our work and tie up our money while he went shopping to beat down prices so as to pick up inferior material to square with a low bid.

"Within three weeks a capable construction crew under an experienced foreman arrived just one day behind the first carloads of material. The stuff was largely shop-assembled. Perfect fittings, adjustable hangers and straight pipe-threads allowed those men to get the pipe up without a hitch. Things fitted. It was a tailor-made job."

"One engineer in a hundred, I'd say," remarked a shrewd-looking man at the end of the table.

"You don't understand yet. In our new plant the higher bids provided for a service and for a freedom in purchasing materials that is out of the question for the average low bidder.

"Our Consulting Engineers made me see that competent contractors are to him what fine tools are to the artisan. Failure to recognize that fact before has cost our company a lot of money. Let us understand and agree now that the old horse-trading, sharp-practice, low-bidder idea will not waste any part of the large sums to be spent under our expansion program in the next three years. Because of the Consulting Engineer's large experience we unhesitatingly accept his plans and specifications. By the same token he is the only logical man to choose the contractor to execute them."

* * * * *

For further information write today to Grinnell Company, Inc., 307 West Exchange Street, Providence, R. I.

GRINNELL COMPANY

Automatic Sprinkler Systems | **Steam & Hot Water Heating Equipment** | **Humidifying and Drying Equipment** | **Fittings, Hangers and Valves** | **Pipe Bending, Welding, etc.** | **Power and Process Piping**

If it's Industrial Piping, take it up with us

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Our little gray folder should be in your files

It will be sent only upon request. It will tell you of many problems we are solving for our customers, and how we do make for them accurately and at a great saving almost everything that is made of

Sheet Metal in light and medium gauge in Steel—Iron—Brass—Copper—Monel metal, etc.

Stamping—Forming—Drawing—Punching and Blanking

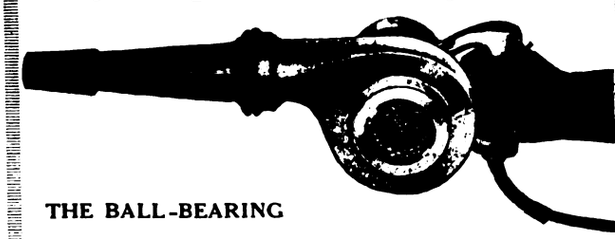


See Data 1924-25 A.S.M.E. Condensed Catalogue of Mechanical Equipment, also Hendricks, Sweet's Engineering and Thomas Catalogues

Our engineers, men of long and practical experience, are at your service, they will help you. Send your blue prints or pencil sketches

THE BREESE BROS. CO.
Cincinnati, Ohio

Test This Blower
in your plant before you buy



THE BALL-BEARING

CADILLAC
PORTABLE ELECTRIC BLOWER

For Cleaning Motors, Machinery, Etc.

Equipped with a ¼ H. P. Universal Air Cooled motor mounted upon the famous NORMA Precision Ball-Bearings.

As confirmed by tests made by the Armour Institute of Technology, the motor has speed of 10,940 R.P.M., volume of free air discharged 47 ft. per minute, velocity of air discharged 224.5 ft. per second, 17" water column pressure.

The CADILLAC is the **original** portable electric blower. It operates from any light socket, needs no servicing and has hundreds of uses around electrical and other machinery.

CLEMENTS MFG. CO.
612 Fulton Street **Chicago**
Canadian Factory: 74 Duchess St., Toronto
Export Department: 149 Broadway, New York City

(*Continued from page* 40)

consequently the selling price. Cafeterias in the exchanges are modeled on the most approved methods commonly used in the large public cafeterias where the public is served. The telephone industry today operates more cafeterias for employes than any other, with the possible exception of department stores. It feeds more employes on the company property than any other public utility group. However, the cafeteria idea has taken hold in almost every direction and the telephone industry is simply applying a system that has been tested in the past twenty years in other lines.

As a matter of fact, almost every industry in the country whose plants employ any great number of workers are adopting the policy of what is termed "group feeding."

There are several reasons which led to the origination of the idea and its beginnings go back as far as 1890. Most of the present factory cafeterias or restaurants today had their beginnings in a twice-a-day coffee service in winter months among the employes doing the heaviest manual labor. In the beginning, a few extended the coffee service to include doughnuts or sandwiches. Then there came the workers' coöperative lunch room, which was a development of employes' coöperative or mutual benefit associations whose capital was put to work in this way to be of the greatest benefit to members. It was the aim to realize a fair margin of profit for the associations on the food served, to give better food than could be purchased at ordinary corner lunchrooms and to make the noon hour more pleasant by close personal association at the table.

However, the "coöp" cafeteria found, in the main, that, with the rising price of food and service the profits were small and uncertain and more often deficits had to be met. At this stage, the employers who had found the cafeteria a desirable departure in welfare work, stepped in and took over the enterprises in order to keep them functioning. Most firms were willing to meet small deficits if such resulted, charging losses up to employe betterment accounts. But the introduction of more efficient methods of management than was possible under the association committee plan, put the larger number of these cafeterias on their feet financially.

Any plants interested in the cafeteria idea will do well to remember certain fundamental facts, the result of many years' experience, before they make an installation.

(a) Everything depends on the manager of the cafeteria.
(b) Modern labor saving appliances and equipment, while making a heavier initial investment necessary, will pay their way and more.
(c) Insist upon a menu designed to suit best the physical needs of the employes.
(d) Hire trained cafeteria help and pay them well.
(e) Strive to make the cafeteria "break even"; gratis meals have been found unsatisfactory and to make a profit dooms the welfare cafeteria to failure.

By the adoption of the plan of eating in three shifts, most of the cafeterias in industry are able to maintain only one chair in the cafeteria for every three employes. That is, a factory employing 500 will require a cafeteria seating only about 165. Such a cafeteria can be easily operated in an area of 15,000 square feet of space and this may be located in any sunny and airy part of the

(*Continued on page* 44)

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A Challenge

To every blue print maker in the world



We know the savings in time and money that the Pease Peerless Blue Printing equipment can make. We know the excellent reproductions it turns out. We know how it is enabling makers of blue prints in any quantity, large or small to reduce their costs. We know all these things—perhaps you don't.

Therefore we challenge every blue blue print maker—not now using Pease Equipment—to a comparative test. We'll pit the Pease equipment against your present method; we're confident the results will be so overwhelmingly in favor of the Pease, that no further discussion will be necessary.

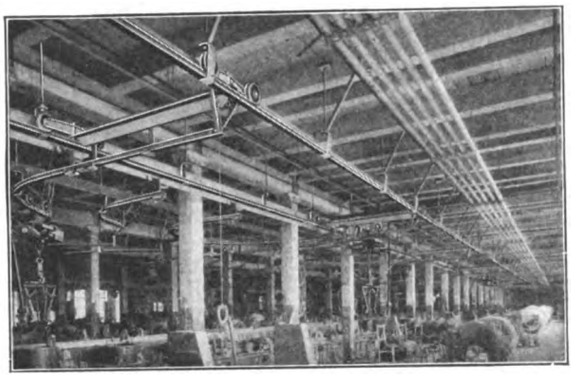
Just write us for further particulars and a copy of our catalog I-23 giving all the facts—remember you'll be under no obligation.

The C. F. Pease Company
828 N. Franklin St., Chicago, Ill.

PEASE
BLUE PRINTING MACHINERY

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The Ceiling Railroad



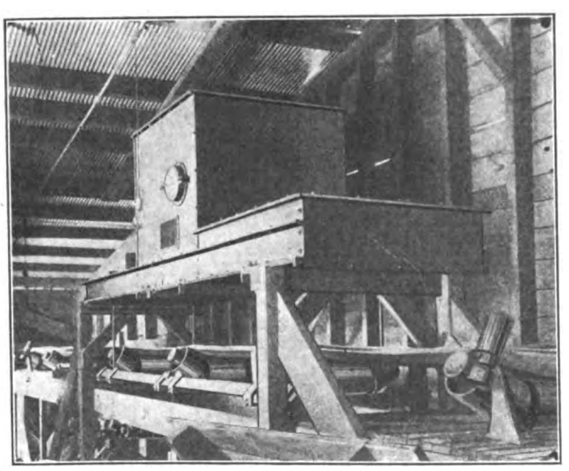
Will reduce your inside transportation rates by eliminating waste and labor cost.

This sturdy, flexible overhead railroad will move your material around curves through switches and turn tables with ease and safety. The Armington Tee-Rail overhead system is second to none in simplicity of design and ease of operation.

This system can be installed quickly and easily by your own men without interfering with other operations.

Our engineers will help solve your inside transportation problems.

The Armington Engineering Co.
Euclid Village, Ohio



Save Time and Money

You can keep your load moving continuously, check your weights accurately — and save time and money with Merrick Weightometers.

The operation is simple. You merely attach the Merrick Weightometer to your present conveyors and as the materials pass over a given point while in transit, the weight is accurately recorded within one per cent of the absolute weight. The operation is entirely automatic—no extra labor needed—no extra expense—Pays for itself out of savings in labor costs, and increased efficiency.

Write for descriptive circulars.

MERRICK SCALE MFG. CO.
PASSAIC, NEW JERSEY

(Continued from page 42)

plant, usually the top floors being selected, though we know of several in airy basements.

While there is no serious endeavor to follow out the rigid rules of dietetics, some attention is paid to the suitability of the food served to the requirements of the employes who eat it. Such a general plan is followed in nearly all of the plant restaurants. Here is the general "guide" used by the manager in doing his buying and in planning his menus for days and often weeks ahead:

Daily Food Requirements of Workers

150 lb. man doing office work needs	2,500 calories
150 lb. man	3,000 "
125 lb. women doing office work needs	2,000 "
125 lb. woman	2,500 "

Amount of Each Kind of Food

	Protein	Fat	Carbohydrates
Man	250 calories	750 calories	1,500 calories
Woman	200 "	600 "	1,200 "

Protein: foods which are essential to the building up and repairing the bodily tissue, include foods of animal origin, such as meat, fish, eggs, etc.

Fats: furnish not only energy but bodily heat are contained in such foods as butter, nuts, oils, cheese, etc.

Carbohydrates: which furnish energy for muscular work, such as starches, sugar usually derived from vegetables, grains and fruits.

While there have been some few failures in plant cafeteria operation, officials declare that this is not due to the idea of employe feeding in itself, but due to the difficulty of getting a director or manager who understands fully the intricacies of food service under conditions as they exist today. While the practice is not general in industrial plants, many of the larger banks now give their employes a good lunch without any charge whatever. In the case of factories or plants, however, this practice is very unusual. If only a nominal charge, some charge is made for the food. Employes do not like to eat free, it would seem. On the other hand, an industrial cafeteria should not make a cent of profit. When employes discover that a profit is being made, they are quick to resent it though there be no just grounds for the prejudice. Many plants turn cafeteria profits, if any, to other employe recreational and welfare channels and always take care to announce that they are so doing. This wards off any unfair criticism which is apt to increase as it becomes plant gossip.

Just what it means to feed 8,000 clerks gratis as is done in one Manhattan cafeteria, is hard to realize. This cafeteria bakes 1,100 pies a day, average. It serves over a carload of fresh meat. The coffee makers comprise a staff of three persons. Over five thousand rolls are consumed daily, five days a week. Merely because the clerks eat gratis is no sign that they have to take what is given them in silence. They are permitted to make suggestions, to file complaints and to make requests.

In many of the large industrial cafeterias, the director is supplied with a dietitian who supervises the purchase of food and who plans the menus days in advance. One of the largest shoe concerns has worked out a scientific method of feeding its various types of employes in groups and according to their physical needs.

A big cafeteria with its vitrolite furniture, its power kitchen appliances and its silver and china appurtenances represents a very heavy investment. One of them in New York represents over $200,000 for equipment alone.

But in the face of these facts, additional employe cafeterias are appearing on the scene quite frequently and nearly every new large plant has a cafeteria included in the plans as a matter of course.

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FRICTION COLLECTS

Advt. No. 2 of the **SKF** *Certified Campaign*
Every statement made in this advertisement is substantiated by an unbiased engineering analysis and report, a certified copy of which may be obtained by you for the asking.



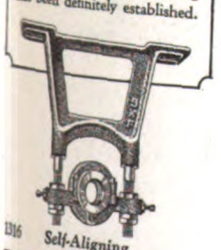
More than 2,000,000 Skayef Self-Aligning Ball Bearing Hangers now in use throughout the world

NO longer does the Friction Ogre take his daily toll of profits in the plant of one of the largest piano manufacturers in the "windy city." No more figures on the wrong side of the ledger since babbitt bearing hangers were replaced with Skayef Self-Aligning Ball Bearing Hangers.

After ten years' experience with Skayef Hangers their faith is unshaken and, as a result, over 300 hangers are now in service. The biggest factor of all is that they have saved on an average of 17 per cent in power and, with other economies, a total of $1,852.41 annually.

Here are dollars and cents facts that prove that it costs more to *keep* babbitt bearings in operation than to *replace* them.

SKAYEF HANGERS
Have delivered satisfactory service throughout the world during the past 17 years. Their dependability and greater efficiency have long since been definitely established.



1316 Self-Aligning

Savings Effected by Skayef Ball Bearing Hangers

POWER:
17% x 355 K. W. H. x 49½ hours x 52 weeks x $ .01 per K. W. H. $1,553.41

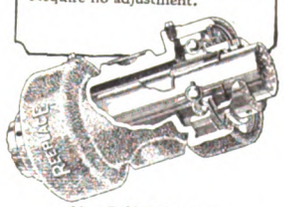
OILING LABOR:
Babbitt bearing hangers would require 10 hours per week x 52 weeks x $ .65 per hour $338.00

SKF hangers require 60 hours per year x $ .65 per hour 39.00 299.00

Annual saving in power and oiling labor $1,852.41

The SKAYEF BALL BEARING COMPANY, 165 Broadway, New York
For Nearest Distributor See MacRae's Blue Book

SKAYEF REEPLACE BOXES
Developed to meet conditions where it may be impractical to remove present hanger frames. Fit regular hanger frames of corresponding shaft size. Are securely clamped to shaft. Take care of shaft contraction and expansion. Require no adjustment.



Not Self-Aligning

BALL BEARING

SKAYEF HANGERS

POST HANGERS, PILLOW BLOCKS SKF Puts the Right Bearing in the Right Place **AND TRANSMISSION APPLIANCES**

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Only $490.00 for This 24 foot Chicago Automatic Drag Type Conveyor



An adjustable wheelframe, ball bearing, three-phase motor including conductor cord plugs and receptacle or 3 H. P. gasoline engine with clutch.

With this Drag Conveyor coal handling costs are down to rock bottom and the first cost is insignificant. No belt renewals, thereby saving from $60 to $200 annually. The Chicago Automatic will pay for itself many times over in the course of a year.

The Chicago Automatic is also made in belt and bucket types.

Order one now. It is all ready for instant service.

Chicago Automatic Conveyor Co.
982 Old Colony Bldg., Chicago, Ill.

Chicago Automatic Conveyors are in use everywhere. We manufacture Portable and Stationary Drag Conveyors for Coal; Belt Conveyors and Bucket Elevators for all kinds of materials.



Scientific Management in Dull Times

(*Continued from page* 33)

minute inventory. The records should at least be kept on a card index. However, if graphic charts are kept, it does aid materially in maintaining a balanced stock.

If the industry had such a Stores Department, the executive is then in a position to outline a plan whereby the purchasing may be curtailed. In laying out this plan, he has before him the Stores Department Report, which shows him the quantity on hand; the days required to obtain new supplies; the quantity required at a standard rate of production, to last this number of days and should also show the quantity required for operating for the dull period, now under discussion. If the material in question is of a perishable nature, the stores report should show the probable loss through aging, evaporation, shrinkage or depreciation. There should be some indication made on the Stores Department Report if an unusual expenditure would be involved in handling or moving an excess quantity on hand.

From such a report the executive is now in a position to find the loss due to investment in raw materials or finished products being excessive, and to determine if it is more economical to store the excess material or to try and move it at a reduced price. Before notifying the Purchasing Department to cut down on these purchases of any given item, it is well also to take into consideration the gain to be obtained, if any, from purchasing in larger quantities, and when this is taken into account, the Purchasing Department can then be informed of the degree of conservatism to be exercised in purchasing the various items.

The Stock Department's Report also forms the basis of changing the amounts of materials to be carried in stock for the sub-normal period. By so regulating the size of the stock, one thereby cuts down the production orders, and thereby effects some economy.

It is possible that one of the greatest joys of a real executive is that of spring house cleaning, or in other words, turning the scrap pile into cash. I will recall an experience some little time ago when the requisitions were coming in like wild fire from the Tool Crib, for tools of all descriptions. Special tools could not be found, and one of the foremen conceived the idea that each and every one of our men were so anxious to do a good job, that they must have a full kit of tools in each of their lockers. So an inspection was made of every man's locker in his presence, and tons of wrenches, special and standard, and other tools were found. These tools were placed back in the Tool Crib and the check system was then started. As a result, the purchase of new tools went down.

The next step is some sunny Saturday afternoon, the foreman of each department with a couple of laborers goes the rounds of his department, and all material in corners; back of machine tools, etc., is then put in a pile where the boss can tell at a glance whether the material found is of value, and he can sort it as he sees fit, sending it to the stock or tool room, or to the junk pile. Speaking of scrap material, the shop that does not have bins for the various classes of refuse, is throwing away real cash.

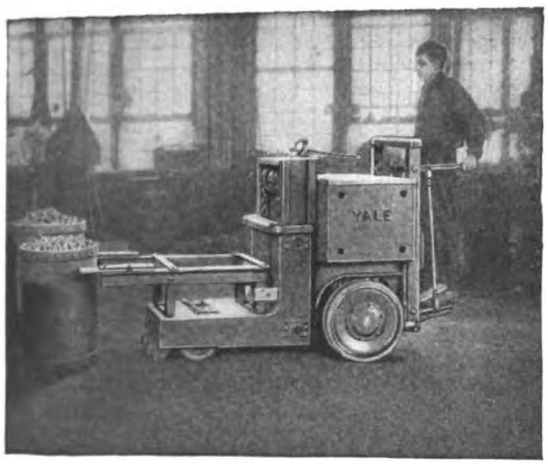
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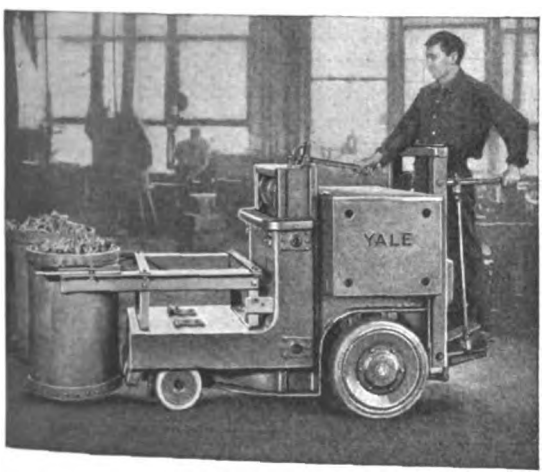
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TRADE **YALE** MARK

YALE – the Key to lower handling costs. Chapter 16 on *Storage Battery Trucking.*

Handling a hot job!







Handling 800-pound cans of hot bolts is a mean job. Many methods were tried in the plant of a large eastern steel company. Finally a Yale K22A Truck was installed and the job successfully "killed" at a saving of nearly $7000 a year.

The photographs show how. Perhaps they may suggest an answer to your problem. The Yale K22A with various special attachments has taken care of some very unusual situations.

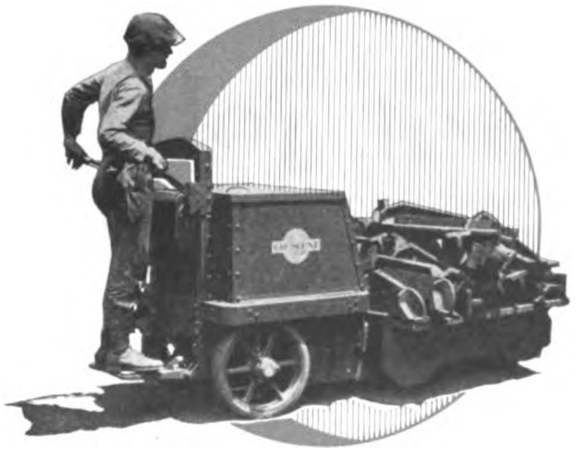
At the steel plant here illustrated, annealed rivets and bolts from the furnaces are delivered into steel barrels. A Yale K22A Truck, with special fork attachment, picks up the hot barrel with its spring actuated jaws, hauls it to the cooling floor, and tiers it, one or two high. The jaws open automatically and the truck speeds back for another load. The driver never leaves the operator's platform.

Yale engineers are constantly being called upon to design auxiliary equipments for special jobs. It is part of Yale service. If you have an awkward handling problem we would be glad to study it. Yale Trucks show a clear saving wherever installed.

The Yale & Towne Manufacturing Co.
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YALE MADE IS YALE MARKED

YALE Hoisting and Conveying Systems

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To Crescentize is to Economize on Handling

There is no lost motion—no effort—no delay. This Crescent Truck is performing its maximum work — at very little cost—not only is it paying its own way, but it is speeding up production in other departments by delivering the material quickly and efficiently.

If this type "GEL" is not what you want, we have a model for your special needs. There is a type of Crescent Truck for every purpose—and a type for all purposes—whatever materials you may handle—packed or loose—in and out of cars—up and down narrow aisles. There is a Crescent Truck adapted for the work.

Tell us your material moving problem and our engineers will gladly recommend the proper model.

We publish a profusely illustrated catalog demonstrating Crescent Trucks in service. Send for it.

CRESCENT TRUCK CO.
165 North 10th Street
LEBANON - - - PA.

It Pays to Crescentize

(*Continued from page 46*)

The next step is that of considering the possibilities of turning a portion of the investment in equipment into working capital. To do this, in an intelligent manner requires proper knowledge of the functions and need of each piece of equipment. This can only be determined by records which show the equipment that is not in use, or if it could be spared without loss of production. When this list is available, the actual disposal of the equipment in question depends on the probable loss or gain from the sale of same, at the present market price. However, due regard must be taken of the possible necessity of using this equipment later. The possibility of obsolescence must also be taken into consideration if the equipment is kept. It is still necessary to give due consideration to the purchase of new equipment later if production needs warrant same, solely for the possibility of the new equipment being more efficient.

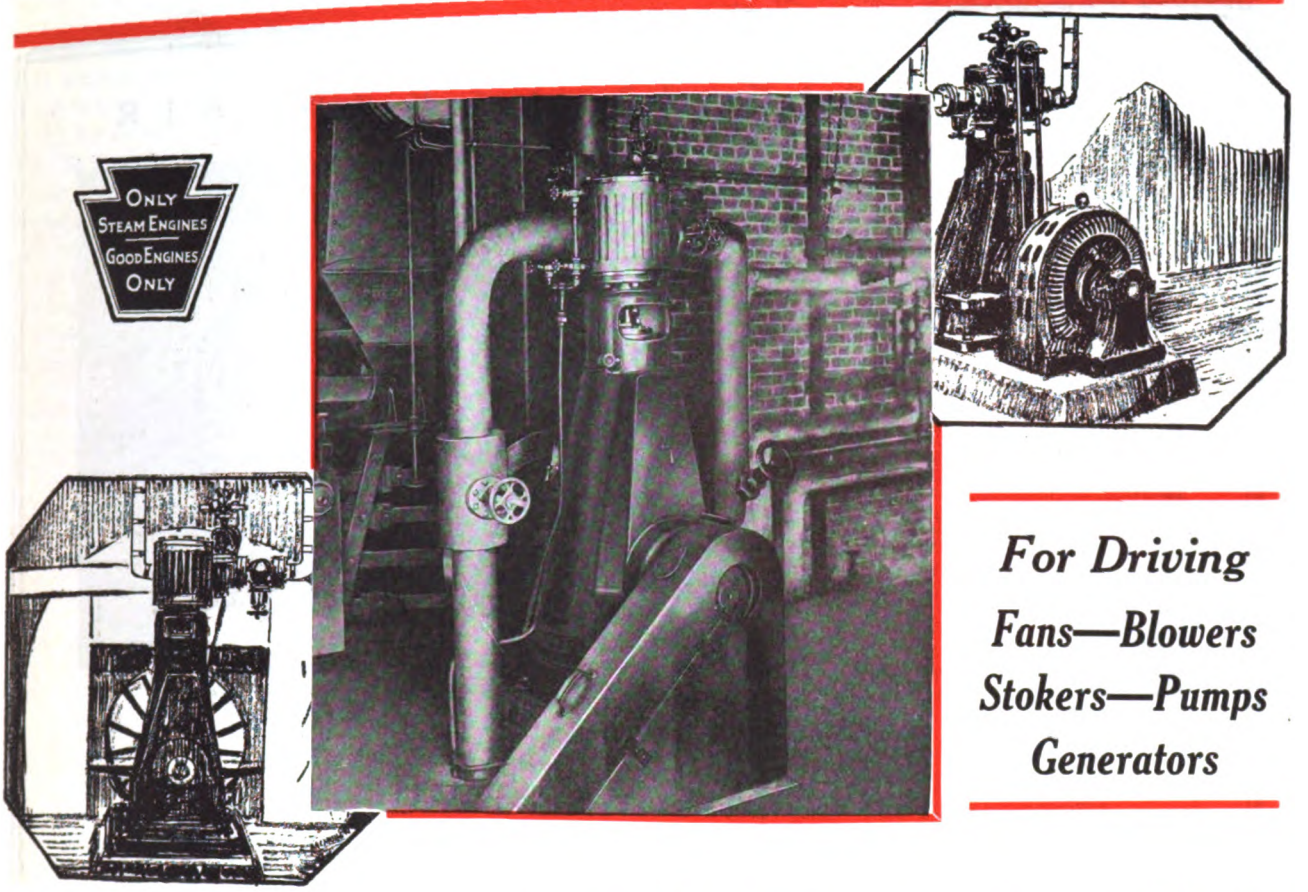
The next step in controlling expenditures in dull times is that of a budget plan. It seems that it takes a prolonged period of depression to make the average executive staff realize that a budget plan actually saves money, and it should not be only an estimate of expenses, but should be a plan of controlling expenses and actually keeping the estimated figures within the budget. The budget can be very accurately figured from the figures of the preceding year, taking into account the changes in production, volume. An example of a budget control sheet is shown. This can be further subdivided so that each department has a budget sheet of its own, and the general office keeps the full data sheet.

With the budget plan in operation it is absolutely essential that a good cost system be kept, in order that the value of the equipment and materials either raw, finished and in the course of process be known at all times. It will be found that a good cost system will distinguish the profitable from the unprofitable articles, it will check the accumulation of obsolete material; put a check on the losses of material and stop pilfering. It will also be an aid in determining the desirable insurances, and due to the comparisons and analysis of waste; repairs, express charges, indirect labor it affords will soon become the means of determining the general policies and will go a long way toward establishing a better bank credit.

Having a good cost system combined with a good stores department, and a proper budget plan, the executive in charge is now in a position to make up a plan for the discontinuance of the least profitable lines. In taking up this subject one is really playing with fire, for the angles of approach are filled with pit falls, and it is only on a very careful survey of the field, taking into account the amount of invested capital tied up, the volume of business to be expected, and the portion of overhead the article bears and its relation to the other products manufactured; that even a guess can be made on the effect of discontinuing a product, on the general business of the industry. I have known a condition where it was found that it was highly profitable to continue a line even though it showed a very small loss, simply because it made possible the continued use of high-priced machines, and thereby when the real profitable articles were not selling, carried a high portion of the overhead that would normally have to be charged to the more paying lines.

(*Continued on page 51*)

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Fans—Blowers
Stokers—Pumps
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Built in a Plant that Builds Engines Only

From foundry to shipping platform the entire Troy Plant is devoted to the building of steam engines. Every piece of equipment is used for that one purpose. We have no other object in view. We have followed the one ideal for 33 years and that is to build the best steam engine possible. Price never entered in the matter yet because of the efficiency of our plant — the economical methods of production we employ — the ideal labor conditions which exist and other factors, we are enabled to build the most expensive types of engines and sell them at a very moderate price.

The new Type S. H. Engines are especially designed for maximum reliability and economy in oil and steam. Although these engines have been built during the last few years, their wonderful performance has been recognized by the many repeat orders received.

The new type S. H. Troy Engines are safest to operate and maintain. They are fully enclosed, therefore dust proof. The lubricating system in all Troy Engines is automatic and all parts subject to wear are always supplied with an abundance of oil. Then there is the relatively long connecting rod, the self compensating admission valve, which immediately relieves the cylinder of any condensation and other exclusive Troy Features which mean longer life and absolute safety.

When the problem of steam economy comes up in your organization consult our engineering staff. Built in sizes up to 200 B.H.P.

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Dependable Power with Absolute Safety

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Installation of Reed Air Filters at the Long Island Studio of Famous Players-Lasky Corporation providing clean dust-free air for the film finishing department.

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"IF IT'S *a Paramount Picture it's the best show in town*" is the slogan of the Famous Players-Lasky Corp. and REED Air Filters help to make it so. Consider the tiny film pictures enlarged one hundred times or more when projected on the screen and the importance of perfect film free from dust or blemishes is apparent.

The selection of REED Air Filters by many of the largest film manufacturers and producers of motion pictures to provide clean air for finishing and drying rooms is proof of their high efficiency in dust removal.

Wherever dust is a menace or nuisance REED filtered air solves the problem. Used by leading industrials—sold on the *try before you buy plan.* An investigation costs you nothing and may save you much.

OTHER APPLICATIONS OF REED AIR FILTERS

General Ventilation, Offices, Factories, Stores, Etc. Electrical Ventilation, Turbo Generators, Mill Motors, Etc. Drying Operations, Paints, Chemicals, Film, Etc. Air Compressors and Diesel Engines. Recovery of Valuable Dusts, Gold, Silver, Platinum, Etc. Control or injurious Dusts.

REED AIR FILTER COMPANY, Inc.
Engineering Department
211 Central Ave., Louisville, Ky.

Gentlemen: Please send me without obligation your informative folder, "Are You Interested in Clean Air?"

Application.....C.F.M.

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Name.....

Address.....

REED AIR FILTER COMPANY, Inc.
211 Central Ave., Louisville, Ky., 50 Church St., New York City
Offices in Principal Cities

Reed Air
TRADE MARK
filters ALL METAL

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(*Continued from page* 48)

At this stage of putting economies into force, it is worth while to consider the reduction of money used in welfare works. All luxuries should be curtailed. However, in the curtailment of welfare work, no curtailment should be made in that which builds up the morale of the men, or that which tends toward improving the relations between the men and the employer. In a dull period the relations between the employer and men must be as smooth as possible, if real economy is to be effected.

It might also be expedient to call to the attention of all employees who have an expense account, that for the duration of the depression that luxuries on the expense account should be an item of the past. Considerable economy can usually be effected in the average sales expense account.

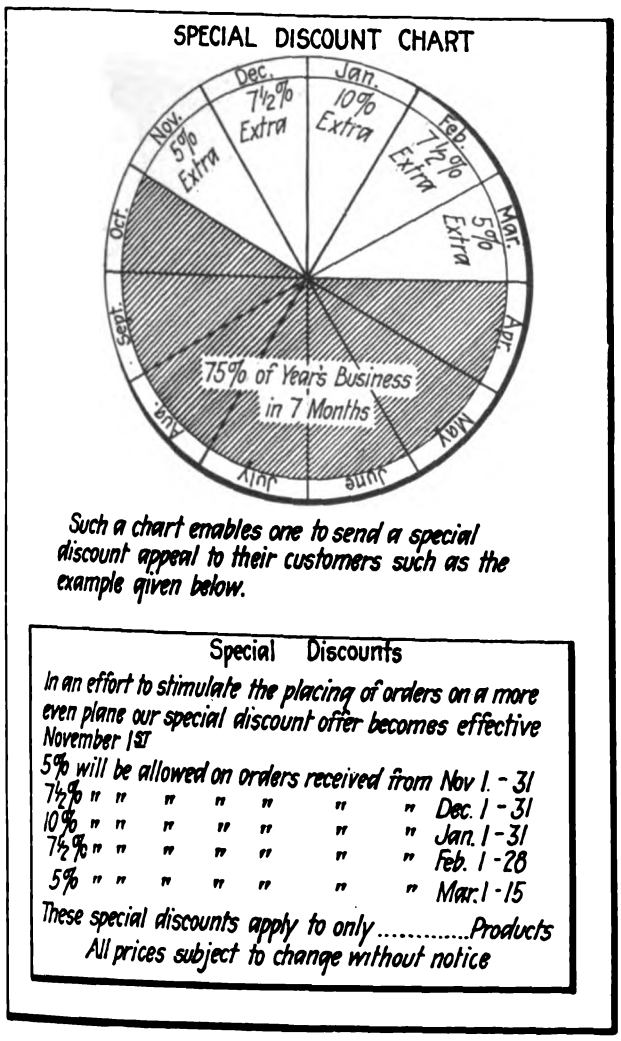


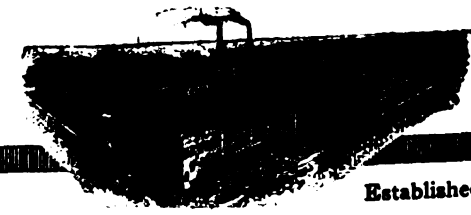
Fig. 4. Special discount chart, evolved as an aid in "ironing out" seasonal buying.

In the dull time period, increased supervision must be paid to the factory maintenance account. It is true, however, that all excessive upkeep expenses should be curtailed, but then again this is the proper time to do all rearrangement of departments and improvements made to the producing capacity of the machinery and tools.

It is surprising the amount of money that can be saved in the use of fuel, power and light. Fuel can be saved as a rule by very simple inexpensive means.

(*Continued on page* 53)

MEDART



Established 1879

Everything in Line Shafting Equipment

Medart probably still is the only industry producing—in one plant—a line of mechanical power transmission machinery in its entirety. In this large plant is produced Turned and Polished Steel Shafting, Couplings, Hangers, Bearings, Friction Clutches, five types of Pulleys, Gearing and kindred appliances of every description.

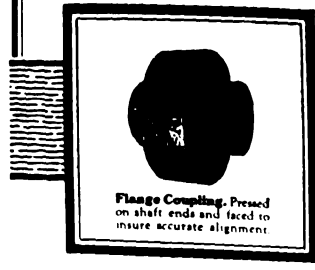
Standardize and economize — use Medart line-shafting equipment exclusively and get the full benefit of concentrated buying, prompt and accurate service and prices that are uniformly satisfactory. Served by 26 railroads out of St. Louis, we can offer quick, dependable deliveries to industry everywhere.

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Send for Medart Catalog No. 43 and prevailing discount sheet. Learn how satisfactory it is to buy the Medart way, or submit your specifications for engineer's estimate, no obligation.

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Flange Coupling. Pressed on shaft ends and faced to insure accurate alignment.


Drop Hanger. Double brace, four-way adjustment, with either ring, collar, wick or plain oiling bearings.

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ADVANTAGES of truck power over man power are obvious to all. But yet some manufacturers still use man power and also hand regulation of temperatures.

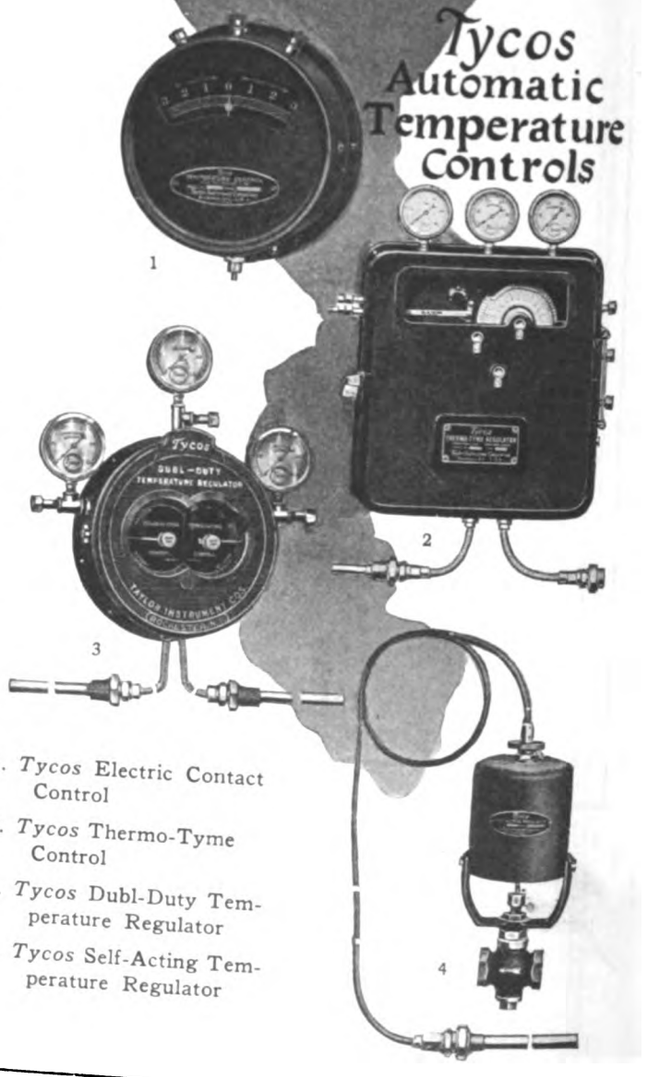
Manufacturers the world over are equipping their plants with *Tycos* Controls as fast as their own conditions will permit them to do so.

Tycos advantages are many. Here are listed a few things *Tycos* controls will do for you:

Insure uniformity of product
Cuts down process time
Increase batch or process production
Cuts out rejections because of under or over heating

Tycos Catalogs are available for all industries. Write now. Mention the ones you desire. No obligation.

Tycos Automatic Temperature Controls



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Tycos Temperature Instruments

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(*Continued from page* 51)

The boiler plant is the first point of attack. Here results can be obtained by:

1. Cleaning the tubes externally and internally, and keeping them clean by blowing the tubes at least once a day.
2. Repair the grates.
3. Plug up all air leaks in the boiler settings.
4. Cover all exposed pipe lines.
5. Remove all leaks.
6. Make use of all the return condensed steam.
7. Use all exhaust steam for heating the feed water, and go over the heating system to cut down trapped lines, etc.

The engine room can be improved by:

1. Repairing valves.
2. Proper setting of the steam valves.
3. Repacking all glands.
4. Reboring the cylinders.
5. Lagging the cylinder with a good heat insulator.
6. See that the return steam traps function.
7. Cover all exposed pipe and remove all leaks from piping and fittings.
8. Provide proper lubrication for the engine.

In the plant, the line shafting should be gone over, all possible friction eliminated and if possible, the group or unit drive system should be installed.

It may even be found that after a proper investigation is made that real economy may be effected by installing an electric drive system, and purchase power from a public service company. The scrapping of the engine equipment would then be in order, retaining only the boiler room equipment for heating.

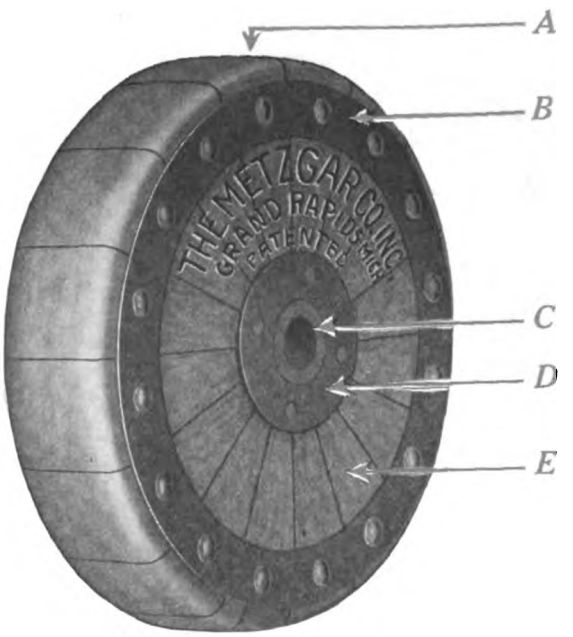
The proper lighting is a subject of great importance, in that it affects production and many other things. It is possible that by a proper study that the hours of working could be so arranged that the use of lights is reduced to a minimum. In general it can be said, however, that it is necessary to spend considerable time in endeavoring to apply direct sunlight correctly to the work in order that a real economy may be effected, in the form of lower artificial light bills, and increased production, and greater possible accuracy in the work produced. A clean white factory is more economical in its artificial light consumption than a dirty dusty factory.

It might be well at this point to bring to the forefront that it is not real economy to discharge valuable employees that have demonstrated their efficiency, and for which high efficiency the company has invested a large sum of money. Rather than discharging such employees, it is more expedient to put forth more effort to improve the quality of the individual workmanship, and build up the individual production by the man.

At this stage it will be wise to very seriously consider the practicability of curtailing the expenses of the experimental department, and for the time being, spend only such money as is necessary toward developing improvements in the most favored productive products.

If it becomes necessary to decrease the amount of money spent for payrolls, better results will be obtained if the rate is not cut but rather that the reduction takes the form of part time work, reduced time or rotation of productive jobs.

A great many executives have made the mistake of curtailing the production and planning departments when it would have been a far more reaching plan, if they



This Small *Metzgar End Grain Wood Wheel* Stood a Load of 21 Tons

In a recent test conducted by the University of Michigan, a stock 10" diameter by 3" tread Metzgar End-Grain Wood Wheel mounted on a 1" axle withstood a load of 21 tons, while a cast-iron wheel of the same size and tested under the same conditions was a complete failure at only 9½ tons.

This test is only one of many other good reasons why many truck manufacturers now specify Metzgar wheels for the better class of their trade. Also, why factory executives are replacing their worn and broken wheels with Metzgar wheels and are standardizing on these wheels for all new equipment.

Better own a car, especially if it is cheaper in the end, with an immergency of 60 H.P. even if you never use more than 30 H.P. than to have one with a maximum of 20 H.P. and be 10 H.P. short where it is most needed.

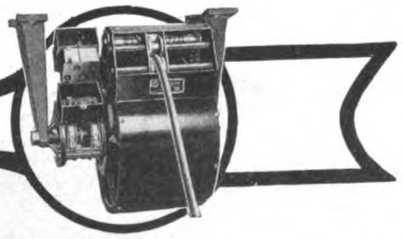
Patented Construction—See Arrows:

A—Exposed or wearing surface of end-grain hard wood—insures long life and will not injure floors.
B—Strong circular bands imbedded in the wood and riveted together through the center of each wedge.
C—End-Wood, fibre or Hyatt bearing may be used.
D—Rigid metal flanges hold the bearing tight.
E—Segments made up of equal sized wedges.

Write for full particulars and let us quote you on your next requirements.

METZGAR COMPANY, Inc.
Grand Rapids, Mich., U. S. A.

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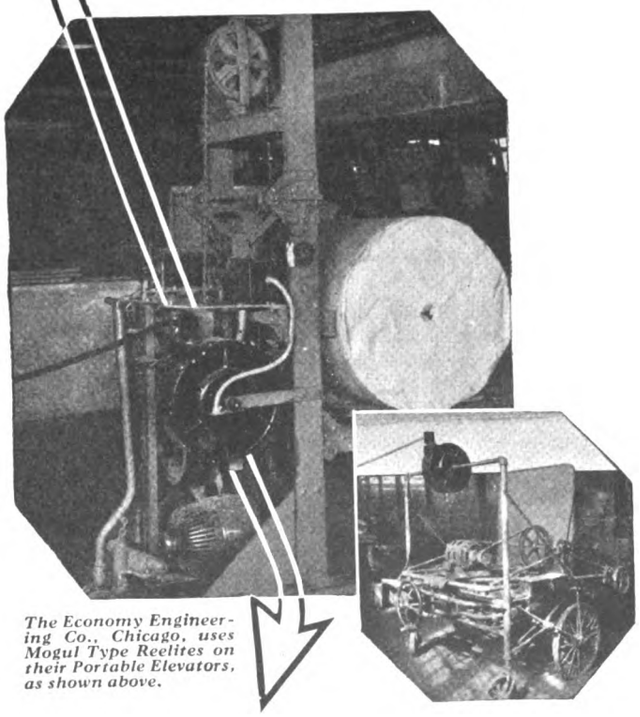
If the Machine Must Move—Remember Reelites Pay for Themselves

TO get the most service out of a portable machine, the cord must be protected. Cord troubles mean expensive delays that hinder production.

Reelite saves these losses by protecting the cord from wear and short-circuits. The cord is kept coiled in a container which automatically pays out and retrieves it in lengths from 10 to 250 feet as required. That's why a Reelite installation quickly pays for itself.

Our engineers will gladly show you how a Reelite can be adapted to your needs. Ask them.

APPLETON ELECTRIC COMPANY
General Offices and Factory
1716 Wellington Ave., Chicago



The Economy Engineering Co., Chicago, uses Mogul Type Reelites on their Portable Elevators, as shown above.

MOGUL TYPE
Reelite
REG. U.S. PAT. OFF.

had seen fit to imbue them with a new life making them see the greater need of their individual attention to such problems as:

1. Classifying and marking equipment.
2. Keying up inspection of the product.
3. Studying the possibilities of wider tolerances in order to permit price reduction.
4. Making plans for re-arranging of the various departments in re-locating machinery to provide increased space for other products.
5. To perfect the transfer department to move orders and goods as directed, and thereby cut down delays to work in process.
6. Working in order to secure uniform production far in advance.
7. The working up of a Master Production Control Board that will assist in properly routing and controlling the production.
8. Planning toward greater simplifications of the product.

In this last item, the production and planning department can by a proper study of simplification make possible a material lowering of the cost of the product, due to the following:

1. Reduction of capital tied up in raw material, semi-finished material, repair parts, finished stock, saving of floor space and a lower amount invested in jigs, dies, special machinery and inspection gauges.
2. Reduction in clerical overhead, a more simplified supervision and inspection, as well as a more simple training of employees.
3. Simplification also does away with the job type of business and makes possible the manufacture in larger units and thereby makes possible a more reliable production schedule estimate.

It has also been found that the best time to make time studies is in the dull time period, for real time study work needs an abundance of time, if the data obtained is to be used to determine which of the following classifications an employee's wages are to be figured on:

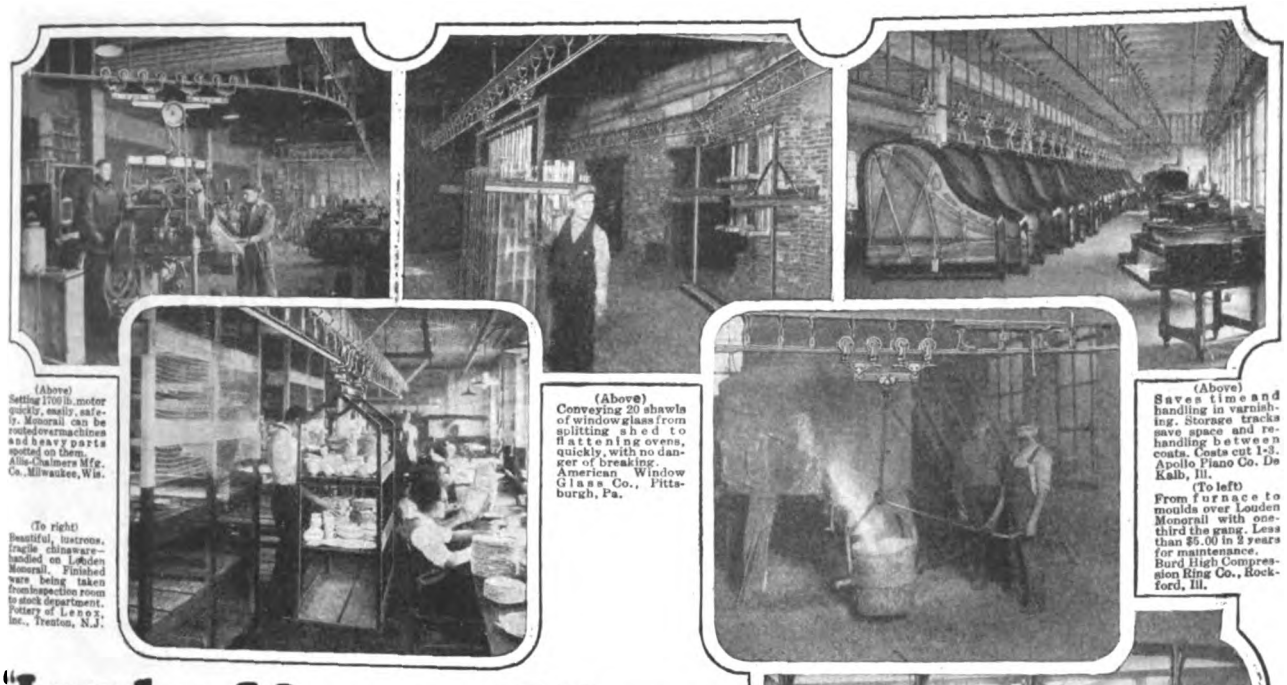
No. 1. Day Work.
No. 2. Standard Time.
No. 3. Task.
No. 4. Piece Work.
No. 5. Premium or the modified Group Premium.

It is remarkable the number of high grade executives who think that time studies are only a means for a wage payment argument, they, however, overlook the many other betterments that are directly the result of time studies made by a real industrial engineer. A few of these benefits are:

1. Checking up faulty planning and management.
2. Proper location of work and tools with most economical arrangement of machines.
3. Correct design of fixtures, jigs and tools combined with real efficiency of supplies and tools.
4. Establishing the proper size of gang with a standard of production combined with a balanced equipment.
5. Makes possible the combination and subdivision of present operations in conjunction with proper handling in previous operations.
6. Makes possible the correct determination of the fitness of the employee to the work, and reduces his fatigue.

(*Continued on page* 57)

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(Above) Setting 1700 lb. motor quickly, easily, safely. Monorail can be routed over machines and heavy parts spotted on them. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

(To right) Beautiful, lustrous, fragile chinaware—handled on Louden Monorail. Finished ware being taken from inspection room to stock department. Pottery of Lenox, Inc., Trenton, N.J.

(Above) Conveying 20 shawls of window glass from splitting shed to flattening ovens, quickly, with no danger of breaking. American Window Glass Co., Pittsburgh, Pa.

(Above) Saves time and handling in varnishing. Storage tracks save space and rehandling between coats. Costs cut 1-3. Apollo Piano Co. De Kalb, Ill.

(To left) From furnace to moulds over Louden Monorail with one-third the gang. Less than $5.00 in 2 years for maintenance. Burd High Compression Ring Co., Rockford, Ill.

"Louden Monorail Saves Us $5,000 a Year"

This is reported by the Griess-Pfleger Tanning Co., Waukegan, Ill.—and scores of other plants, in many widely varied lines of production, likewise give credit for large savings to Louden Monorail as against old methods of man-handling material.

In practically every line of industry, where loads up to 2000 lbs. must be moved, you can profit by using

LOUDEN

OVERHEAD CARRYING EQUIPMENT

In large plants and in small ones this active material handling equipment which is so moderate in cost, has proved itself to be one of the greatest of all production economies—a saver of labor, time, floor space, floor wear, rehandling expense and breakage. "We save $1544 a year with our Louden Monorail System, or 100% on the investment," reports the H. R. Mallinson & Co., Inc., Astoria, L. I. "It reduced our pouring gang from 20 to 6 men," is the word from the International Motor Co., New Brunswick, N. J. And the Martin-Parry Corporation says that "Louden Monorail used at York, Indianapolis, Lumberton, and in 18 or 20 of our branches is saving us, roughly, $8,000 to $10,000 a year." These reports are typical of many others in our files.

You should see one of these amazingly active Louden Systems at work to thoroughly appreciate how it can and does reduce production costs. Smooth-running trolleys on a strong, safe track with sturdily built switches that are quickly and accurately operated, keep production humming and sing a song of savings that will surely warm your heart.

Let us refer you to an installation in your vicinity or advise one of our nearby Engineers to call and go over your plant for the purpose of making a report to you. Without obligation, of course. Set a date to suit your convenience.

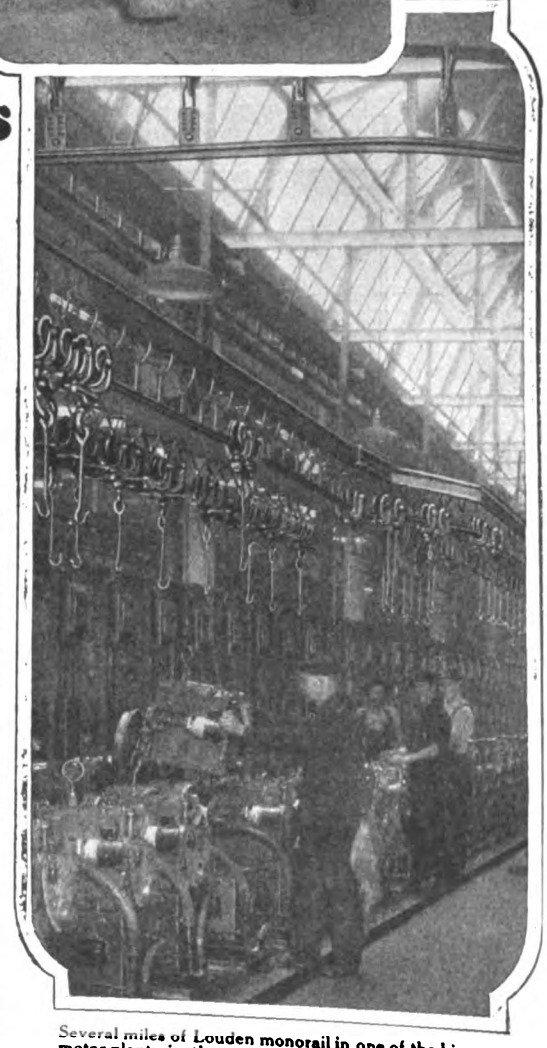
Send for Louden Overhead Book

It pictures many installations in various industries—from a few feet of track to many miles. Tells an interesting story of how other concerns have cut production costs. Send for your copy.

THE LOUDEN MACHINERY COMPANY

585 West Ave. Established 1867 Fairfield, Iowa

Branches in Principal Cities



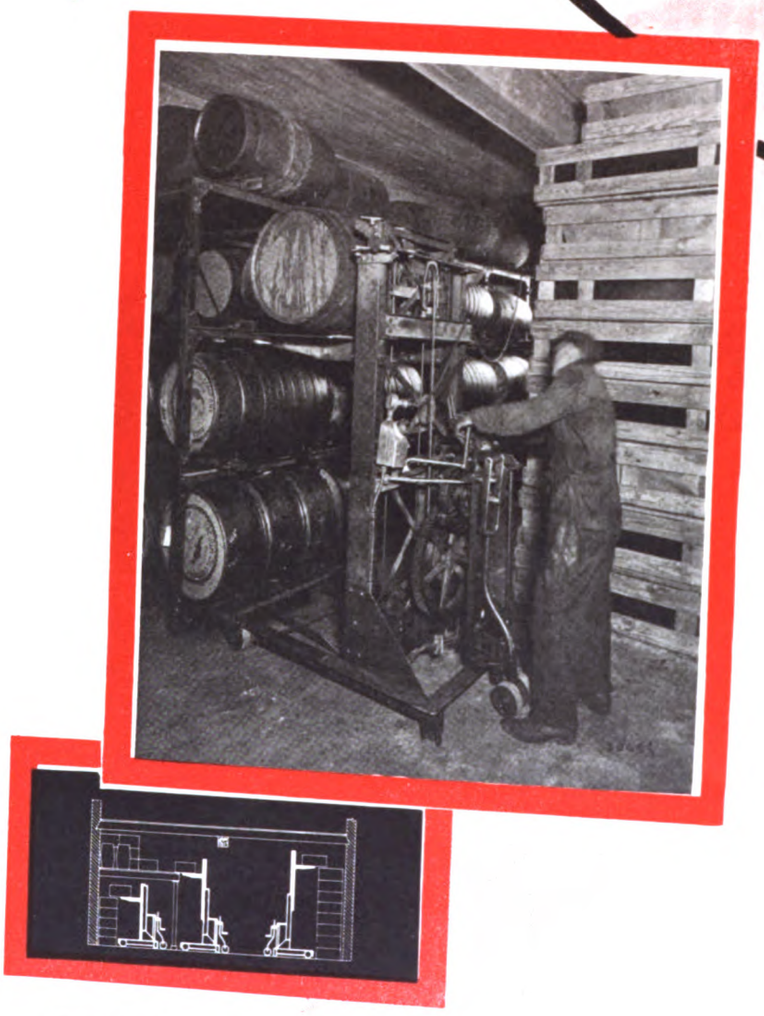
Several miles of Louden monorail in one of the biggest motor plants in the country. It is used in continuous operation handling raw materials, parts finished and complete products from supply to machines, from machine to machine, and finally to warehouse or shipping platform. This installation has made possible increased quantity, speedier work and a lessened cost of production.



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How would you like to have a telescoping man?





just like having a "Mutt and Jeff" in one body.

A Man short enough to work under the lowest balcony or beam—to go thru low doorways and on to elevators, and all—***without stooping.***

Yet in the open able to reach up and work as high as the ceiling, in spite of obstructions.

Well there is such a man—a mechanical man, who comes as strong as desired and to any height to fit your requirements.

His cost is low—and he'll pay for himself three times a year in savings.

You should know him—his name is *Economy Telescoper*

—let us tell you more about him?

Economy Engineering Company

2663 W. Van Buren St., Chicago
342 Madison Ave., New York City

ECONOMY LIFTERS

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(*Continued from page* 54)

7. It correctly sets price rates or shows the possibility of using wage incentives.

When the executive has his factory and general organization lined up, he is now in a position to really lay out plans to obtain increased sales or at least put forth a greater sales effort.

The first essential factor in obtaining a greater sales effort is an accurate chart of the Sales, over a period of years and still further subdivided into months or periods. (An example of charts made up from such data is shown in Fig. 3.)

These charts will then clearly show whether the business volume is seasonal or regular. If the volume is seasonal, then it is quite a help to the sales organization in pushing forth for increased volume, if plans are laid out and based on accurate cost data, to put into effect special discounts for certain periods to endeavor to stimulate the placing of orders in the off season. (An example of such a discount plan is shown.) There is also the possibility in making a reduction in the prices to more truly represent the replacement value in terms of lower material costs, and also based on more efficient and increased production.

A careful survey should be made to determine if the proper methods of distribution are being used in conjunction with the advisability of changing the selling methods.

The name of the product often bears an important relation to the volume of the sales; to illustrate this, I recall one instance where a corporation was endeavoring to sell one of their products under the corporation name, and was not having the success looked for. Then some one conceived the bright thought of selling this product under the name of one of the sub-divisions of the corporation, and within a short time the sales were materially increased.

The changing of the unit of sales combined with a change in the package or color often produces a marked improvement in the sales.

It is often advisable to give due thought to changing the class of people sold to. By this we mean that quite often the manufacturer has sold to a certain class of jobbers or dealers, and it is possible that a drive by sales direct to the owner or user will produce beneficial results, or quite often the reverse of this procedure in the case of the manufacturer who has sold to the consumer direct, will result in increased sales volume.

It is quite possible that the addition of a new product will help out over the dull period. I recall in one case that one industry was able to run its foundry overtime by taking on outside foundry work, when the rest of its plant was extremely short of work, and by this method of procedure, was able to carry on in a fairly satisfactory manner.

The most generally used and most practical method of increasing sales in dull periods, is by direct advertising. This does not mean that indirect advertising should be cut out, but it should mean that it should be materially curtailed.

In any direct advertising the first duty of the efficient sales manager is to sell his own salesmen. This can be done by putting out a little paper or bulletin in the form of a house organ to get over the close working spirit of the organization. This should be combined with a prac-

(*Continued on page* 59)



Let us send you a copy of the Erie Booklet—free for the asking

There's Plenty of Labor and Power in Erie, Pennsylvania

The labor problem has never been a problem in Erie. Plenty of skilled and unskilled labor, both men and women are always available.

Power is available in unlimited quantities.

Situated mid-way between New York and Chicago, Erie has an unusually advantageous location. Information concerning sites, business opportunities and industrial activity will be cheerfully given.

Send for free illustrated booklet describing Erie, the third city in diversity of industry.

ERIE CHAMBER OF COMMERCE
ERIE, PENNSYLVANIA

FIX IT QUICK *with*
Quickfix
Concrete Floor Patcher
Sold on Make Good or Money Back Basis



Patches Holes in Concrete Floors in 48 Hours!

Eliminates danger of employees injured, material damaged, operations impeded.

Floors Patched Saturday, Ready for Use Monday

QUICKFIX makes a concrete patch of flint-like hardness in only 48 hours. Ordinary concrete patches block traffic and delay production for ten to twenty days while they harden. With Quickfix you can Patch the Floor Saturday and Open It Up to Traffic Monday. No costly delays or interference with plant's operation.

Use Quickfix and eliminate the danger spots in your floors quickly.

THL MASTER BUILDERS CO.
7016 Euclid Ave.
Cleveland, Ohio

Factories: Cleveland and Irvington
Sales Offices in Ninety Cities

Any handy man can use it. Send for our Quickfix Booklet with full details—order ten gallons today.

The Master Builders Company,
7016 Euclid Ave., Cleveland, Ohio.

Gentlemen: Send us complete information about:

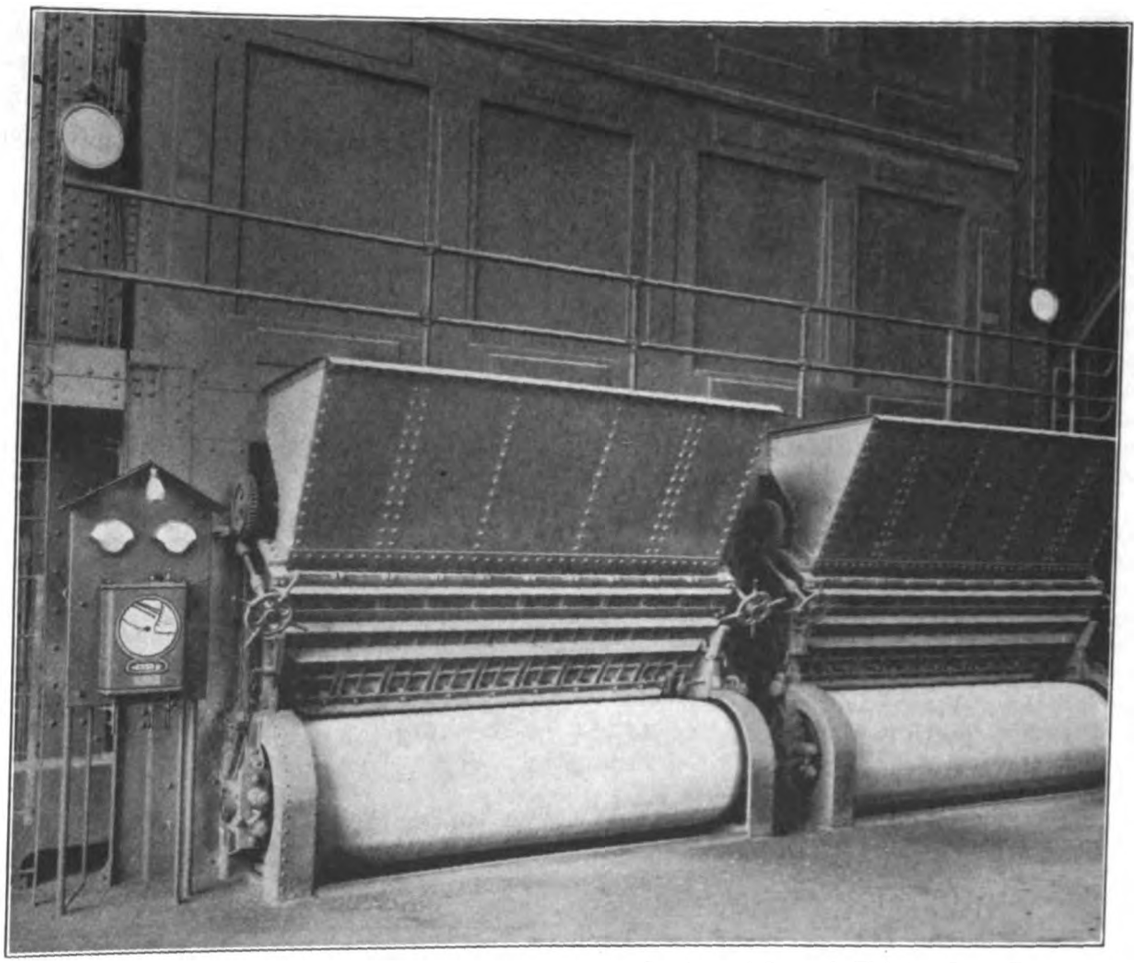
QUICKFIX—for making permanent wearproof concrete patches in 48 hours. We have ——— Sq. Ft. to repair.

It is understood there will be no charge if Quickfix is not all you represent it.

Name .....

Address .....

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American Sugar Refining Co., Baltimore, Md. Courtesy of Stone & Webster, Inc.,—Engineers

BAILEY BOILER METERS

RESULT IN

MORE STEAM FROM THE SAME FUEL

They guide the firemen in boiler operation, making it possible to detect the boilers which are not carrying their share of the load. They also give an instantaneous and reliable indication of the amount of air to use for most efficient combustion. They show when the boilers are in need of cleaning.

By reducing the heat loss to the stack more B.t.u. are available for producing steam. This results in increased efficiency and capacity and is sure to make a big reduction in your operating costs.

Send for information telling in detail how the installation of Bailey Meters will save you money and giving figures showing the results being obtained in other plants.

BAILEY METER COMPANY

2041 East 46th St. **Cleveland, Ohio**

When writing advertisers please mention Industry Illustrated

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(*Continued from page 57*)

tical issue of a good sales manual, and followed up by frequent sales bulletins. It is even possible that it would pay to get up a correspondence course on the products of the firm. Many salesmen have been known in hard times to come across strong when some merit plan for increased sales is put into effect. Often this need only be some fitting prize, but the most helpful stimulant to the salaried man is a commission on sales over a certain amount.

The next step in direct advertising is to consistently and thoroughly follow up the wholesaler, first sending him a "Teaser" on your products.

Follow this up by a good "Broadside" and then the "Folders" combined with the multi-page letter heads setting forth the facts and possibilities of your products. In other words, keep your product before him by mail and your personal interest in him by means of your salesmen.

The next step is to stimulate a demand for your products; this can be done only by a campaign to the individual or the user. This can best be accomplished by mail distribution of letters relating to your products combined with booklets, envelope enclosures and miscellaneous displays. The indiscriminate broadcasting of expressive catalogues, unless you are in the mail order business, is never justified.

The keynote of scientific business management is having the proper accounting and operating data and then keep everlastingly striving for harmony, maximum productivity consistent with maximum accuracy of the product and greatest possible volume.

MODERATE improvement in the statistical position of the copper industry was effected in 1924. Production by American refineries again increased, but not so much as in either of the two preceding years. Domestic consumption increased somewhat and exports in marked degree. The result was an appreciable reduction in stocks of the refined metal. Prices of copper, which were materially lower in the first half of 1924 than a year earlier, turned upward in the summer and rose sharply in November and December. At the end of the year the 15 cent level was reached.

The outlook for the industry in 1925 is encouraging to producers. Estimated consumption last year was double the annual average in the five years immediately before the war. The continuing expansion of industrial activity in this country and further progress in the restoration of normal conditions in Europe give promise of more general prosperity for the industry. The chief problem confronting producers is the maintenance of output at levels not too high to permit profitable operations.

Stocks have now been reduced to moderate proportions. It is possible, however, that for some time to come, even in a period of generally active business and rising commodity prices as a whole, prices of copper will remain relatively low; although as leaner ores are drawn upon, values will tend to advance. Moreover, the existing disparity between copper prices and the general level of commodity prices will tend to minimize the resistance to rising values for the metal.—*The Guaranty Survey.*



And Now the Type "R"
the Strong, Powerful ROEPER Hoist with the fewest Parts

Light in weight, but substantial and highly efficient is this ROEPER Type "R" Hoist. It has very few parts. Spur Gear and Worm Driven, with the difficulty of adjustment between worm and gear eliminated.

It has a totally enclosed Dust Proof Frame and all parts automatically lubricated.

Capacities 500 to 4000 lbs., inclusive. Write for complete description.

ROEPER CRANE & HOIST WORKS Inc.
1728 N. 10th St., Reading, Pa.

TRAVELING CRANES ELECTRIC HOISTS TROLLEYS

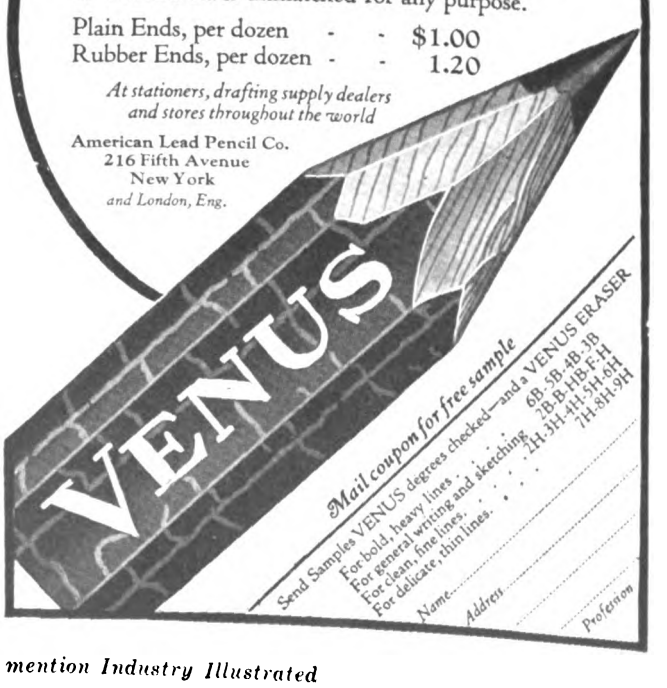
VENUS PENCILS
The Largest Selling Quality Pencil in the World
17 Black Degrees—3 Copying

WHATEVER your pencil requirements—hard, soft or medium—you will find the QUALITY of VENUS leads unmatched for any purpose.

Plain Ends, per dozen - - $1.00
Rubber Ends, per dozen - - 1.20

At stationers, drafting supply dealers and stores throughout the world

American Lead Pencil Co.
216 Fifth Avenue
New York
and London, Eng.



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HOFFMANN

PRECISION ROLLER BEARINGS



Make Good Machines Better

With all the speed qualities of the best ball bearings—with a steady load capacity far greater than that of any ball bearing—with a large temporary overload capacity—with ability to meet shock, jar and vibration—with magazine lubrication to protect them against careless or neglected oiling—"Hoffmanns" are supremely the bearings for heavy-duty machinery.

Our engineers will be glad to work with you, in applying these high-precision heavy-duty bearings to your machines—to reduce maintenance, improve performance, increase output.

NORMA-HOFFMANN BEARINGS CORPORATION
Stamford-Connecticut
PRECISION BALL, ROLLER AND THRUST BEARINGS

N5



"RADE-MARK

WICKES VERTICAL WATER TUBE BOILER

Ever cleaned a boiler, lamed your back, bruised your knees, and skinned your elbows doing it?

You don't do that in a WICKES. You stand erect, your most comfortable and efficient position.

Two men can open, wash, close, and fill the WICKES in five hours. Turbine in ten hours.

Ask for Bulletin:

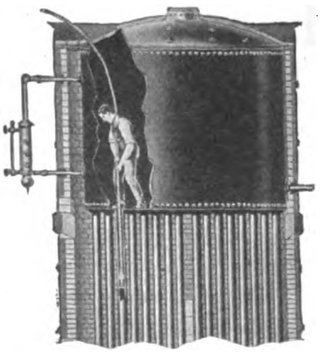
"Reducing Cost in the Boiler Room" Sent Free.

THE WICKES BOILER CO.

Saginaw, Michigan

SALES OFFICES:

Detroit, 1116 Penobscot Bldg
Chicago, 76 West Monroe St.
Seattle, 736 Henry Bldg.
Pittsburgh, 1218 Empire Bldg.
New York, 501 Fifth Ave.



Man Stands Erect Cleaning

Just Suppose--

You had coming to you every month a big bunch of Pictured Progress such as you see in this copy of

INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And *wouldn't* it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

Engineering Magazine Co.,
120 West 32nd Street, New York

SEND ME INDUSTRY ILLUSTRATED every month for a year. I shall remit when your bill comes—sometime within the next thirty days.

Name .....

Mailing Address .....

Company .....

Position .....

ANNUAL SUBSCRIPTION $1 Foreign, excepting Canada, $1.50

When writing advertisers please mention Industry Illustrated

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A Hero Who Refuses to Be Forgotten

(*Continued from page* 18)

six expert duellists, who, in spite of their extraordinary ability as air pilots and sharpshooters, never once succeeded in so much as wounding him was not merely a matter of luck; nor has the rapid growth of his company and the almost instantaneous popularity of his car been due to any desire on the part of the public to do him honor by buying his product. His success in his every undertaking since, as a stripling lad, he determined to get a job in the one and only garage at that time in his native city, has been due to a fair amount of ability and an exceptional amount of energy and determination.

Born in Columbus, Ohio, October 8, 1890, one of seven children of parents in very modest circumstances, Edward Vernon Rickenbacker was introduced to hard labor when as a child he quit the seventh grade in school and got a job in a glass factory, where he worked twelve hours a night, six nights a week, for $3.50. After about six months in the glass factory, he quit his job at three o'clock in the morning, walked several miles to an iron foundry, and started to work there at six, making iron cores for a dollar a day. After a few weeks there, he quit and tried his hand at making soles and heels in a shoe factory, then at bottling beer in a brewery, at carving monuments, at woodwork, and in the railroad shops.

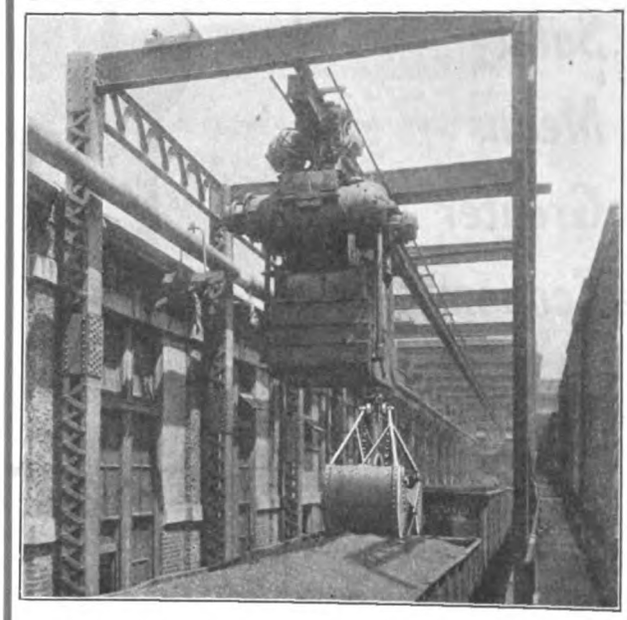
The automobile was then but a possibility. There were a few cars on the market and there was a garage here and there, but the "horseless carriage" had not ceased to attract throngs of doubters whenever it appeared on the streets. There was a combination garage and bicycle shop in Columbus and young Rickenbacker determined to get a job there. He knew nothing about automobiles, of course, but he promptly proceeded to learn all he could about them by enrolling for a course with the International Correspondence Schools, and by experimenting with the cars in the garage every time the boss stepped out.

In 1904, Rickenbacker, still but a lad, left the garage and entered the engineering department of the Frayer-Miller Air Cooled Car Company, where he spent two years, then went into the factory for a year and a half. Frayer then went to the Columbus Buggy Company, which had begun to make electrics and two-cycle, air-cooled cars, and Rickenbacker went with him. The following year the company began manufacturing the Firestone-Columbus car and Rickenbacker was the tester who put the first of these cars through its paces.

The new cars that had been sold in Dallas, Texas, and vicinity, developed heating troubles and Rickenbacker was sent out to find the trouble and remove the cause. He did so by installing new pumps in all the cars, then remained there in charge of sales for the Texas-Louisiana territory. After about two years here, he was sent to Omaha to take charge of sales in Nebraska and Iowa.

In the meantime, Rickenbacker had taken a minor part in several automobile races, usually as mechanician. At Omaha he began racing at fair grounds round about, chiefly as an advertising stunt, and seldom found difficulty in winning. Racing became more and more popular during the next three years and in 1913 he resigned to become a professional racer.

Hayward Buckets



Reduce the *total* cost of your coal

REDUCING the cost of coal *delivered to your boilers* depends largely on the efficiency of your coal handling equipment.

Right here is where Hayward Buckets can be used to your advantage. Made in various types and a large number of sizes, there is a Hayward exactly suited for each type of hoisting unit—each one especially adapted to the combination of conditions of service, the type of hoist used, and the material to be transported.

Hayward Engineers can be of particular help in solving the coal handling problems of your power plant—whatever the size, or conditions of service may be. Call on our Engineers whenever you wish. Their services are rendered without cost or obligation to you.

Bulletin 617 will be particularly interesting to power plant executives at this time. Send for your copy.

THE HAYWARD COMPANY
32-48 Dey Street New York, N. Y.

Builders of Clam Shell, Orange Peel, Drag Scraper, and Electric Motor Buckets, Dredging, Excavating, and Coal Handling Machinery



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Safety Means Greater Economy



Executives who are making every effort to control power plant operation should bear this in mind—safe operation leads to lower costs.

Vigilant Feed Water Regulators protect against boiler explosions, but also result in fuel conservation.

They operate by gravity—no floats, tubes, or diaphragms to get out of order. The action is automatic and no reliance is placed on the human element. Write for a catalog.

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh



As a professional, Rickenbacker built special racing cars, applying his own knowledge and getting many suggestions from different manufacturers as well. At the time this country entered the World War, he was perhaps the most popular racer in the country, having won numerous victories on the speedways. Among these were the Sioux City 300-mile contest, which he won on three different occasions; the Fourth of July 350-mile sweepstakes at Tacoma; the first and second 300-mile events at Omaha; the 300-mile Metropolitan Trophy at Sheepshead Bay; the 100-mile sweepstakes at Indianapolis; the 300-mile race at Des Moines, and the Ascot Park sweepstakes at Los Angeles.

Rickenbacker got his first experience in the air after he went to France as a sergeant in the signal corps. He then became a flier only after considerable maneuvering to get away from other positions to which he was assigned and it was not till March 6, 1918, that he saw the German trenches from the air for the first time.

Between April 29, when he won his first victory, and October 30, when he won his last two, Captain Rickenbacker shot down twenty-eight enemy planes, two of which victories were never officially verified.

Laurence La Tourette Driggs, in his foreword to Captain Rickenbacker's book, "Fighting the Flying Circus," says:

"Rickenbacker is full of the feeling of responsibility that every true leader must know. He is frankly scared over the additional risks that leadership must force upon him. Yet he carries on, assuming these additional risks, which in truth not only limit his private success but constantly threaten to sacrifice his life for a companion."

In recognition of his achievements, Captain Rickenbacker was awarded the Distinguished Service Cross with nine oak leaves, signifying that he had won this distinction no less than ten times; the Croix de Guerre with four palms, signifying that he had won this reward five times; and the Legion of Honor, the highest honor France can confer upon a soldier.

Discharged, in 1919, with the rank of major, Rickenbacker turned his energies to the formation of a company to manufacture automobiles. B. F. Everitt, a man of wide experience in the automobile manufacturing field, became president of the company, while Rickenbacker was chosen vice-president and director of sales, and expert engineers were associated with them.

As director of sales, Rickenbacker mapped out a program that called for world-wide distribution of his product in five years' time. He went out in the field and personally appointed distributors in principal cities. Then he kept in close touch with them by making periodical trips from coast to coast. On these trips, he called on each distributor and usually made at least three talks; one to the service men, one to the salesmen, and one to the distributor's dealers and associates. In some instances, he also talked to a group of Rickenbacker owners. Incidentally, he made these trips in record time, usually averaging better than a city a day. It is said that he is now about a year ahead of his five-year schedule of world distribution and has kept the factory continually oversold ever since it entered production.

In view of the circumstances, it is only natural that many should wonder whether Rickenbacker is an executive of his company indeed as well as in name. Some even now are under the impression that he is chiefly a

(*Continued on page 64*)

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New P&H Steel Cab Corduroy Crane Ideal for Industrial Yard Use

P&H Corduroy Cranes are now regularly equipped with steel cabs—giving better protection to the operator (one man for a P&H), but permitting secure locking when not in use.

The P&H—gasoline or electric motor driven—is an all-around crane whose range of operation is not limited. It travels anywhere on its corduroy traction, is readily maneuvered in the yard or even inside buildings.

Because of this greater range, it performs more work than larger, bulkier cranes—and is more economical to operate and maintain. As one industrial executive says:

"We have been using this piece of equipment on the difficult job of excavating ground for a tunnel 7 by 7 and about 900 ft. long, to be used for power transmission lines. In this work alone we estimate that the crane paid one-half of its cost in the first six months of use. We also find that we can unload pig or scrap iron much cheaper with this corduroy crane."

The high grade design and construction are on a par with those found in P&H Electric Traveling Cranes and Hoists.

Let us mail Bulletin 40-X, which gives all the details.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
Established in 1884
3850 National Ave., Milwaukee, Wis.

New York	Kansas City	Portland
Philadelphia	San Francisco	Memphis
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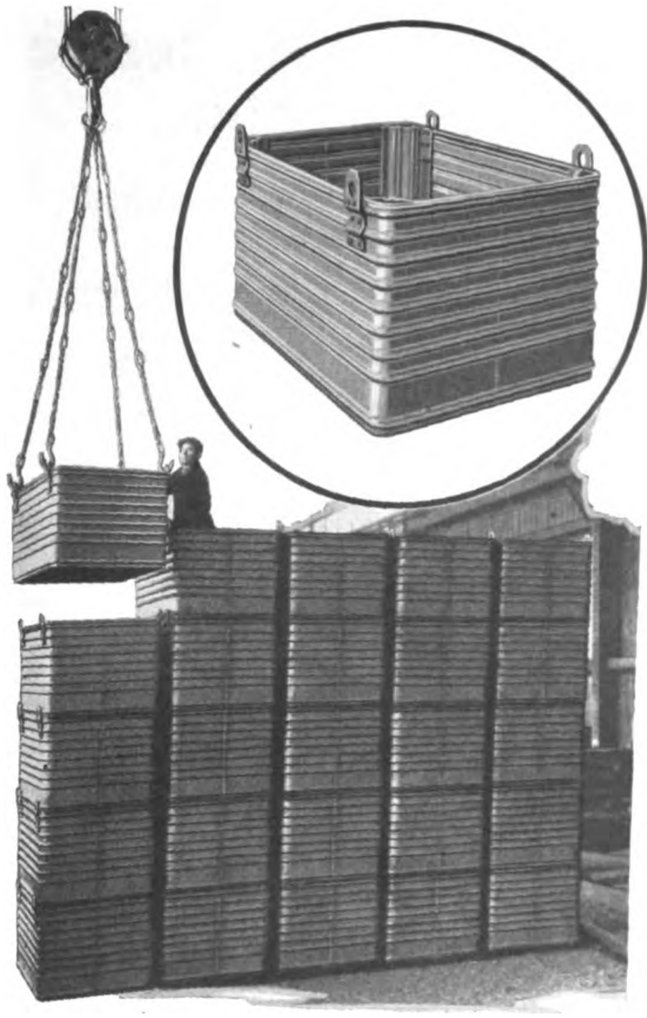
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The New P&H Power Clutch Control relieves operator of the hard work of manual pulling of levers—he simply moves the levers easily into position and the engine power does the work. Greater speed of handling is the result.

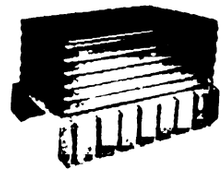
P&H CORDUROY CRANES

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Where Simpler Handling Means Decreased Cost

Truscon Alloy Steel Crane Handling Boxes bring speed and economy to industrial operations where storage and handling of many parts are necessary. Every handling operation is expensive. Truscon equipment reduces handling costs and makes for greater economies.



Truscon Steel Boxes and Steel Platforms for economic storage and easy lift-truck handling

Truscon Crane Handling Boxes have extreme durability due to rib construction, special double-turned flange at the top and steel column corner reinforcing. Truscon standardization and unlimited resources assure lowest cost consistent with high quality.

Experienced representatives at our various offices are ready to study your individual handling problems. They will furnish suggestions, estimates and details at your inquiry.

Write for detailed information on Truscon Steel Platforms and Steel Boxes

TRUSCON STEEL CO., YOUNGSTOWN, OHIO

Special Platform and Box Representatives in New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Buffalo, Detroit, Boston, St. Louis and Cincinnati.

TRUSCON ALLOY STEEL PLATFORMS AND BOXES

(Continued from page 62)

name; a publicity agent to be sent out to have his picture taken in company with the distributors; that he has little stock in the company, and that he has little or nothing to say in directing its affairs.

An outline of his experiences has been given above to show just what qualifications he had for the position at the time he became vice-president and director of sales of the Rickenbacker Motor Company. As a lad, he worked in a garage, then in the engineering department of an automobile factory, then in the factory; then he was sent out into the territory as a trouble man, then he became director of sales in important territories, then a professional racer—in which capacity he built several special racing cars—and finally, an officer in the World War and America's Ace of Aces.

Not an Engine—But . . .

Now we come to some intimate details, secured by the writer from various sources that, obviously, cannot be named, but that are, nevertheless, reliable and conclusive.

Captain Rickenbacker is not an engineer. He knows a great deal about automobiles and he can get perhaps more out of a motor than any other man in the country, but he is not a production man. He has, however, contributed several features of the Rickenbacker car, including the double fly wheel, four-wheel brakes, balloon tires, an oil rectifier, and some details of body design.

The first Rickenbacker blueprint included four-wheel brakes and Rickenbacker did everything in his power to have them retained, but he was overruled by the directors, who feared to take so radical a step at that time.

Rickenbacker advocated balloon tires for two years before they were ever adopted by any manufacturer.

In the case of the oil rectifier, Rickenbacker did not design or invent this, but he did insist on trying it out when his engineers claimed it would not work—and it did work.

On the other hand, he has made mistakes. After a trip to Europe, for example, he was persuaded that we should adopt the European small-cylinder design and he overruled the objections of his engineers to it. A few of the cars were actually produced in the Rickenbacker plant before he became convinced that he was wrong. As a result, he has voluntarily suggested that perhaps he had better leave the details of engineering to the engineering staff.

Captain Rickenbacker is the third largest stockholder and is the highest salaried executive of his company.

He is absolute director of sales and has been from the first. He has had two sales managers under him and has personally dismissed both—against the wishes of other executives.

He has difficulty in keeping a stenographer, because he is the only executive of the company who insists on working Saturday afternoons—and sometimes Sundays, too. He won his honors in the war partly because he spent more time in the air than any other aviator, and he has a tendency to follow the same tactics in his present position. He is a man of tremendous physical and mental energy and he is prodigal in the expenditure of both.

There is a saying that President Everitt avoids a fight, while Captain Rickenbacker seeks one. By this is meant.

(Continued on page 69)

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Mechanical Handling Means Increased Profits!

Thousands are Taking Full Advantage-Some are Considering-To the Latter We Offer:-



1st *To send a Practical Conveyor Specialist to your Plant to go carefully over your requirements—*

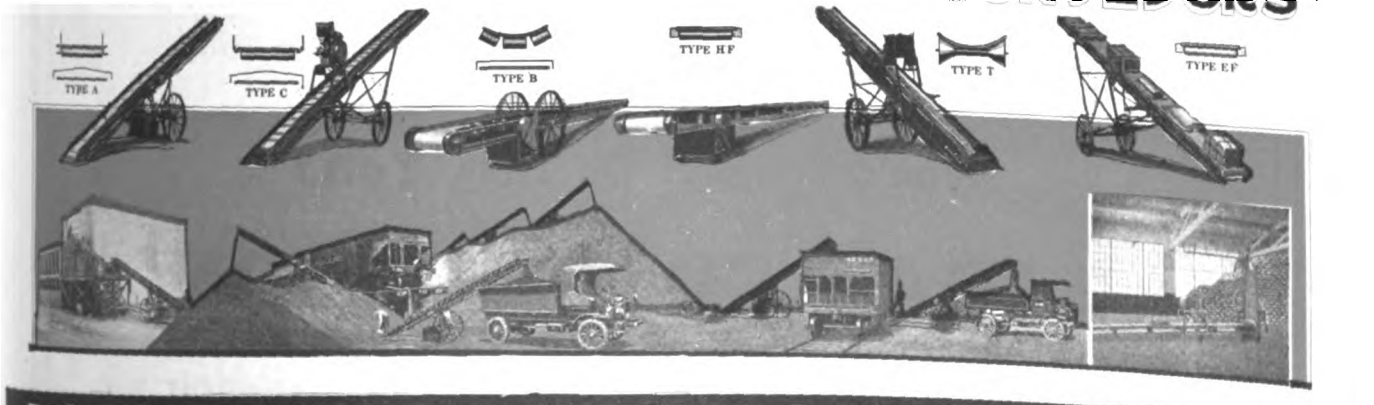
2nd *If he judges that a conveyor will save you money, we will ship one to you on TRIAL—*

3rd *If the Conveyor in operation does not prove to you that it will show at least a 50% RETURN on the investment you can ship it back to us—at our expense—and without obligation.*

ACT NOW!
WRITE, PHONE or WIRE

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A COMPLETE LINE OF PORTABLE CONVEYORS



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3 THINGS

1st. **Improper Combustion Control—**

Resulting in a Waste of from 5% to 20% of the fuel, and accompanied by one or more of the following conditions:—

High Maintenance Costs
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Resulting in Scale, Corrosion, and all the trouble and expense that go with these two evils.

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Resulting in a dangerous and costly condition due to Plugged Up Superheaters, Valves and Pipe Lines, and Excessive Maintenance of Steam Turbines, Engines, etc.

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BOWMAN BUILDING **PITTSBURGH, PA.**

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This is the steel storage warehouse of the Bourne-Fuller Company, at Cleveland, Ohio. It is completely covered with Robertson Asbestos Protected Metal roofing and siding. It is daylighted with Robertson Skylights. The ventilators you see on the roof are Robertson Ventilators.

Moved Twice Used Thrice

Here's a story that's full of significance for any designer, builder or owner of industrial buildings. Follow the arrow. It points to some Robertson Asbestos Protected Metal (APM) that has been twice moved (taken down) and twice re-erected. In other words, these APM sheets have proved so enduring — so immune to all metal-destroying influences — that they have been used *three times* on the same building.

You see, the first two sections of this building were erected in 1914; the next two were added in 1919; the last two in 1923. And every time an addition was made, these sheets were found to be in such excellent condition that they were re-erected on the new section. Nine years of service without painting or repairs! And they're in excellent condition today, as you can see.

How different the story would have been if these had been ordinary unprotected metal sheets! This building is exposed to the corrosive action of smoke, steam, atmospheric moisture from Lake Erie, sulphuric acid fumes from a nearby plant, etc. Unprotected metal is short-lived under such conditions.

APM used as roofing and siding on your plant buildings will perform just as satisfactorily as it has on this Bourne-Fuller warehouse. It will cut your roofing and siding costs in two over a period of years. And behind APM we put a comprehensive engineering and erection service which brings real savings in time, labor, and materials. We have just published a book which tells the whole Robertson story. A copy is yours without obligation. The coupon filled out and mailed will bring your copy.

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Factories: Ambridge, Pa.; Sarnia, Ont., and Ellesmere Port, Cheshire, England.
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Have your secretary fill out this coupon and put it in the mail. It will bring you a free copy of our new book, "The Answer to the Building Problem of Today." You'll find this book just what the title indicates. Don't fail to send for your copy.

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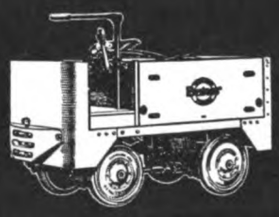
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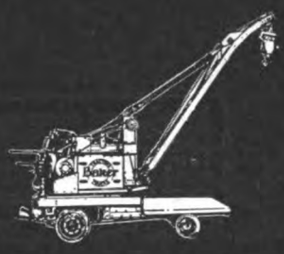


If you need an industrial tractor or truck you pay for it whether you buy it or not.



Every Baker machine cuts down overhead and releases from 5 to 15 men for more productive work.

The average Baker installation repays its purchase price in money saved during the first six months of service.

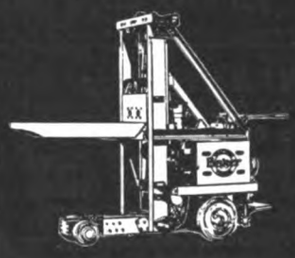


Every wearing part of any type of Baker standard tractor or truck is interchangeable with any other standard type.





In addition to the regular line, many special trucks are built for unusual uses.



A Baker engineer will gladly study your requirements and recommend the most economical equipment for your plant.

Thirty-five sales offices throughout the country are equipped to handle your requirements promptly.



Explanatory catalog of all types of Baker industrial trucks and tractors sent promptly on request.

The Baker R. & L. Co.
Cleveland, Ohio





Repeat orders are



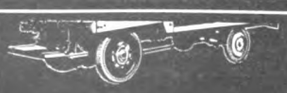
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ELECTRIC TRACTORS AND TRUCKS

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Baker

firms that have demonstrated their economy by experience



speeds up production, lowers labor turnover, eliminates much of



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(*Continued from page 64*)

of course, that the latter has opinions and is not averse to backing them up, while the former prefers to seek the advice of his associates before reaching a definite conclusion.

There is another saying to the effect that, if you want a quick decision on any question, go to Captain Rickenbacker.

He is a man of keen analytical ability. He sees "through" a problem almost instantly and forms conclusions at the same time. He lays definite plans far into the future and adheres to them. One man who has known him intimately for many years pronounces him, "a cold calculator—the coldest calculator I have ever known."

He is accustomed to reach decisions quickly and to act on them instantly, and it has been rather difficult for him to realize that in such an organization as that with which he is now connected, changes cannot be made instantaneously or orders obeyed even more quickly. If a change is made in the car, he wants to know whether the production department will have it completed by next Monday; if he conceives an idea for an advertisement, he wants to "shoot it" in the next edition of the papers; if he decides to revise the sales manual, he wants it done by day after tomorrow. This, of course, sometimes gets him into difficulties. When, for example, the initial advertisement announcing four-wheel brakes on all models declared that any model without four-wheel brakes was obsolete, some dealers who had old models still on hand wished he had waited a little later to make the announcement. This tendency to drive has been perhaps his greatest fault, and is doubtless a result of his military training, but he has now overcome it to a considerable extent.

On the other hand, he is quick to assume blame and he never "passes the buck." If he makes a mistake, he is ready to admit it and take the consequences.

He never "plays to the grandstand." Master flier that he is, he has never performed one stunt in the air since he returned from Europe, in spite of the fact that he has repeatedly been urged to do so. He has travelled by aeroplane, yes, and he has dedicated a few flying fields, but he never engages in needless maueuvers and he is one of the most cautious fliers that ever held a "stick." When he talks before the public, as he frequently does, he talks about automobiles and service; he never mentions his exploits in the war on such occasions and he avoids the subject even in personal conversation.

Captain Rickenbacker's is a commanding figure and his voice is an exceptionally deep bass. In repose, his features are austere, but he has a warm smile that breaks out frequently as if to correct the impression produced by the usual coldness of his countenance. No one who has met and talked with him would ever believe that he occupies a nominal position of any kind—and he doesn't.

Captain Rickenbacker is not the production manager, the works manager, the engineering genius, or the financial head of the company that bears his name; he is the director of sales and as such, he is about as capable an executive as one is likely to find anywhere. As he believes that in this day of standardization selling is far more important than production, it would appear that he is the right man, in the right place.



Foot Protection

—for your employees without cost to you.

IN your plant Safety First Shoes will reduce the number and cost of foot accidents—just as they have in hundreds of shops and foundries. This important protection need cost you nothing.

Just cooperate in the sale of Safety First Workshoes to your employees, either by carrying a stock to insure convenient delivery or by ordering them as needed. A minimum amount of effort on your part will protect your men against painful and possibly disastrous injuries.

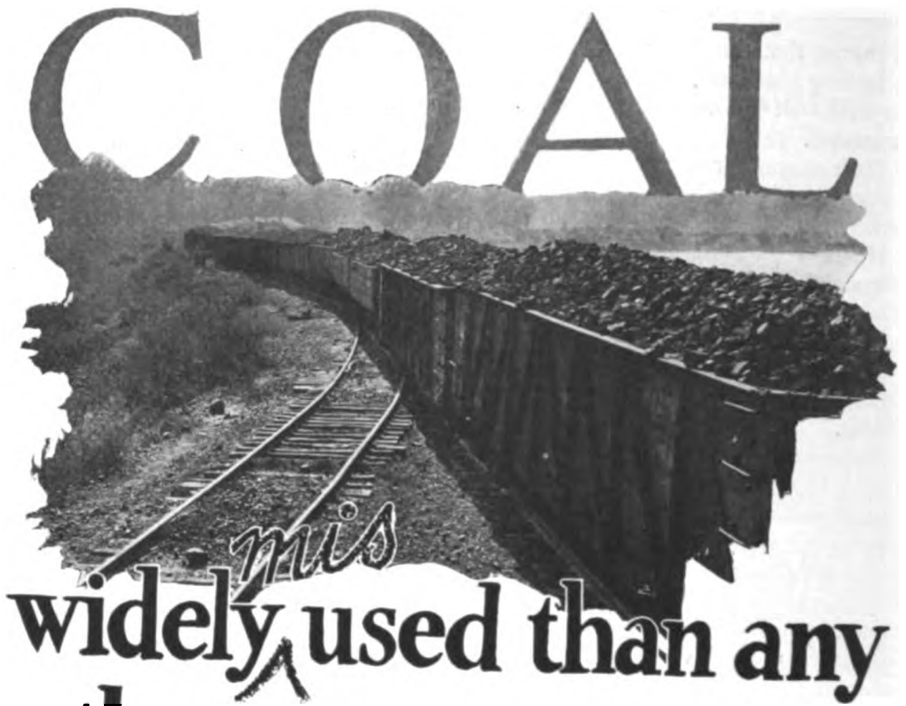
We will gladly send you on memorandum a sample assortment of Safety First Workshoes with suitable literature for your bulletin board. A post card will have prompt attention. You will not be obligated in the least.

Safety First Shoe Co.

119 Summer St. Dept. 11 **Boston, Mass.**

Note—The Price of the Safety First Shoe illustrated above is $3.95 a pair. Freight allowed on twenty-four pairs.

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~is more widely used than any other raw material

WITH the exception of coal, every material used in manufacturing is carefully bought, carefully checked and carefully used. Coal, it seems, is largely taken for granted. As a result, the most widely used of all raw materials is probably the most misused!

This is simply a tradition carried over from the time when the cost of coal was negligible—but consider this:

While coal is still the cheapest fuel for most uses, it is a manufacturing item of such staggering proportion that it is deserving of far more thought than the thousands of other materials which are the subject of hairsplitting cost records.

Acting upon this fact, thousands of manufacturers have installed mechanical stokers. And by so doing they have effected greater savings in production cost than can be made by any other equipment representing a comparable investment.

These manufacturers will tell you that the correct firing of coal is the greatest step in reducing production costs.

The facts are clearly presented in the book, "Coal—the Basic Fuel." Write to the address below for your free copy.

STOKER MANUFACTURERS ASSOCIATION

Ten cars of coal—or nine?

Mechanical stokers save coal by increasing furnace efficiency. They also make it possible to burn cheaper grades and sizes of local coal. Ten per cent saving is a conservative estimate.

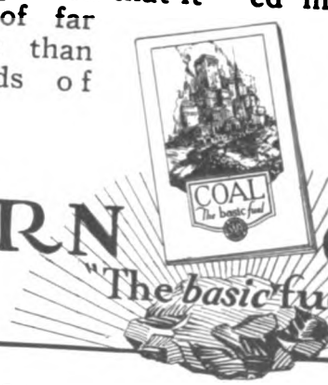
Five men or three?

Stoker firing will cross at least two men off the pay roll if adopted by a hand fired plant now requiring five men. The better working conditions appeal to a better, steadier class of men.

Four boilers or three?

Greater steam demands can be met without adding to your present boiler equipment. Three boilers can be made to do the work of four through the higher combustion rate made possible by—

STOKER FIRING



BURN COAL

"The basic fuel"

STOKER MANUFACTURERS ASSOCIATION

W. V. McAllister, Secretary, foot of Walker Street, Detroit, Mich.

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The Swiss Machine Industry

(*Continued from page 28*)

a group of industrial centers that compare in a most favorable light with such great producing sections as the Ruhr Basin of Germany, the Lille industrial center of France, the Milan and Turin sections of Italy and the Pittsburgh of our own country.

To suppose, however, that the development of Swiss industrial life has been a period of uninterrupted prosperity, growth and expansion, is a theory that needs devotion of but little time and space to explode. And to theorize, as well, on how far the industrials of the country, to be colloquial, are "still in the woods" after world-wide depression following the conclusion of the greatest and most devastating war in all history is but another way of propounding the questions of "What happened to the industries of neutral countries in the World War?" and "What effect has the past four years or more of peace in Europe done in bringing trade back to normal?"

Taking the two questions in order, one can choose as an example no better criterion than that of a large Swiss manufacturer in showing some of the hardships and difficulties surrounding the development and continuance of industrial life in a nation surrounded by warring factions. By hardships and difficulties it might be well to clarify, the writers mean the securing of raw products, such as coal, chemicals and metals, difficulties in obtaining an adequate number of workmen, surveillance by the warring nations of industry within the country and price factors.

To most, perhaps, the geographical position of Switzerland as a neutral country in the World War would appear to have been ideal, in the graphic sense of the word, in instituting an expansion of industrial life and commerce, and one making as well for great financial returns. In a restricted sense, such a supposition is fundamentally correct—official figures proving that Swiss industries grew in extent and size some twenty per cent. between the years 1914 and 1918—but at the same time it must be remembered that Switzerland is, unlike our own country, entirely dependent on outside sources for the major supply of raw material and therein, it might be said, "hangs the rub." To consider, for instance, the one phase of securing adequate supplies of fuel, coal particularly, it is worthy of note that the Sulzer Brothers Company, one of the largest in Switzerland, during the war had to change their entire system of plant heating from coal to electric. Previous to 1914, Swiss industries obtained practically all coal, both gas and metallurgical, from Germany. During the war and since the occupation of the Saar and Ruhr coal regions, the industrial leader of Switzerland has had to import practically all supplies of coal from England, France, Belgium and the United States, while but an insignificant amount has been obtained from Germany. An agreement made between the governments of Switzerland and Germany during the war, specified that the latter country was to supply Switzerland with 160,000 tons per month, but at no time was Germany able to deliver more than 100,000 tons. Difficulties in securing adequate supplies of fuel, however, were not the only troubles experienced in this direction. Price factors have exerted, and still continue to exert, a tremendous influence on Swiss industrial life. It may be interesting to note in



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THIS valuable, interest-compelling book will be sent absolutely without charge or obligation on your part.

It tells, in plain language, how to cut factory costs about 50% on one important item. Tells how to eliminate expensive errors that spoil goods and ruin the reputation of the manufacturer.

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No matter whether you are a manufacturer, purchasing agent, superintendent or engineer, you will find this as instructive as a text book on the subject of thermometers.

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Made by the manufacturers of the famous Boyce Moto Meter



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A Marvel Portable Blower will increase your Machine Efficiency and Reduce Repair Costs



Try one for 10 Days Free

This compact and efficient portable tool will become an indespensable aid in keeping your motors, generators, switchboards and machines free from dust and dirt.

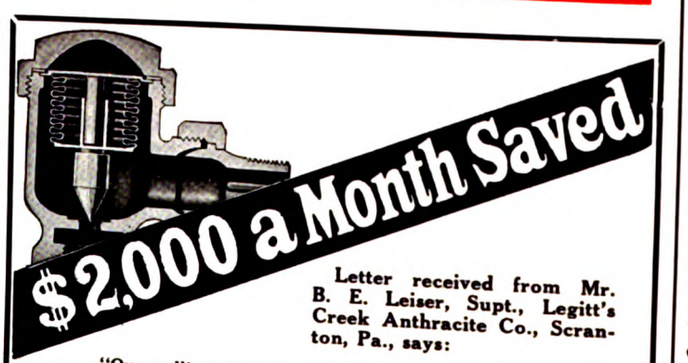
This Portable Blower is also suitable for use on blow pipes, soldering outfits, and small gas and oil furnaces.

Built compactly — light weight — only 6½ lbs. — handy to use — popularly priced—only $40.00. It has an air cooled universal AC or DC 110 volt or 220 volt ball bearing motor perfectly balanced. 20 feet excellent cable and armored plug. Toggle switch in handle, operated by thumb. Metal conduit carrying wires motor to handle. Absolutely guaranteed to give entire satisfaction. Let us send you a Marvel Portable Blower on 10 days' free trial.



Electric Blower Co. **352 Atlantic Ave.**
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"MARVEL" PORTABLE BLOWER



$2,000 a Month Saved

Letter received from Mr. B. E. Leiser, Supt., Legitt's Creek Anthracite Co., Scranton, Pa., says:

"Our colliery is completely equipped with Sarco Steam and Radiator Traps, which are working very satisfactorily.

"We changed all our heating to exhaust steam this winter, using Radiator Traps. This has produced an economy of $2000.00 per month."

This is a statement unsolicited and unbiased.

There are thousands of well run factories and plants that could save tens of thousands of dollars by overhauling their heating systems and using Sarco Steam Traps and Radiator Traps.

Why not get full particulars about Sarco Traps? Simply ask for Booklets R-49 and R-118.

SARCO CO., Inc., 236 Broadway, New York City
Boston Buffalo Cleveland Detroit Chicago Philadelphia

PEACOCK BROS., Ltd., Montreal

RADIATOR TRAP **SARCO**

this connection the price ranges for coal during the war years and up to the present time. The years 1914 to 1918 witnessed steadily mounting costs for all kinds of fuel, the price for bituminous coal in 1918 delivered to Switzerland being 220 Swiss francs. The so-called era of peace brought about a gradual reduction in price of this commodity. June, 1922, witnessed coal selling at 60 to 70 francs per ton. The occupation of the Ruhr by the French, however, again brought about an immediate advance in price, so that today the Swiss industrial is paying 70 to 80 francs per ton. And if the occupation of the great coal producing centers of Germany continues over the present winter, Swiss industrials believe that the price factor will approach an even greater ratio.

Another instance is shown in present prices for iron, which show a fifty per cent. increase since French occupation of the Ruhr and a like increase being shown in costs for ship plates. Despite present high prices, however, and the willingness of the Swiss industrial to pay them, coal shortage is still a malignant sore and daily threatens to assume ever more serious proportions. Even the railroads of the country are feeling the pinch due to high prices and present unstable conditions of supply and delivery.

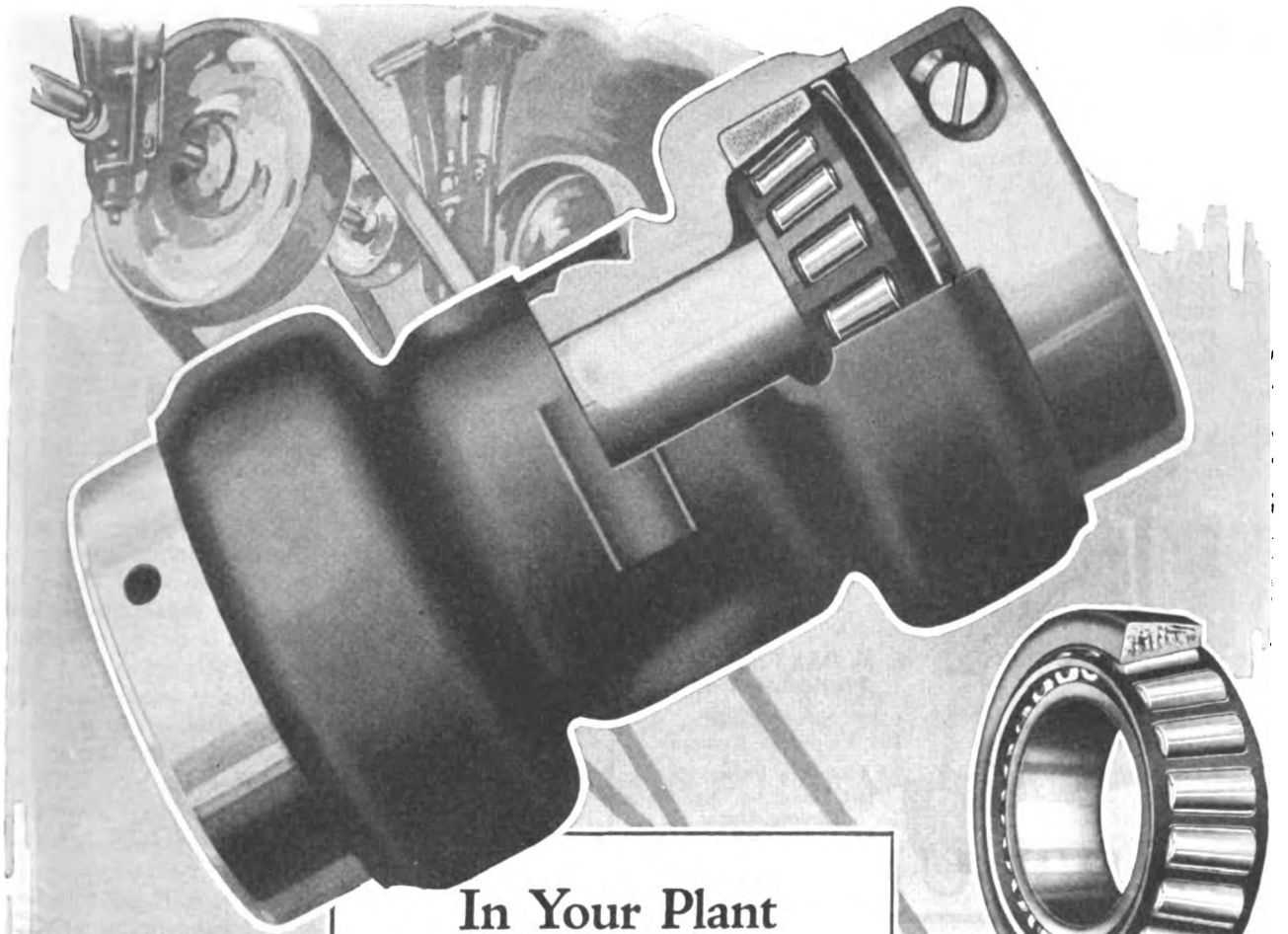
With respect to the less direct factors bearing on production during the war, but nevertheless just as acute in their ultimate bearing on the situation, some mention must be made of the methods of surveillance and jurisdiction exercised on Swiss industrial life by the warring nations, both the Allied group and that known as the Central Powers. Both the warring groups maintained at Berne, Switzerland, their own commissions established primarily to oversee Swiss production and to establish wherever and whenever possible contracts for the output of Swiss industries. The Allied Commission, for example, consisted of some eight hundred men and women officially called the S. S. S. (Societe Suisse de Surveillance) and which was rather ironically called by the Swiss "Souverainite Suisse Suspendue." The German commission, called the "Treuhand Gesellschaft," was composed of about 1,200 men and exercised much the same powers of control as their enemy commission. That these bodies, through the potent power exercised of restricting necessary imports of raw material, made export trade for the Swiss industrial a hazardous and extremely difficult procedure, is perhaps unnecessary to mention.

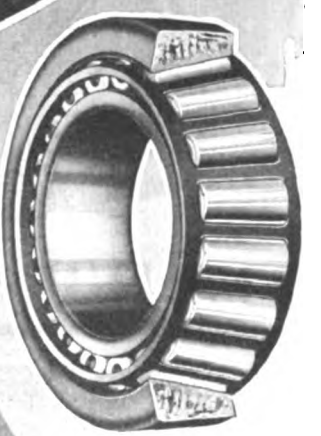
Despite the above mentioned handicaps, however, there is no denying that Swiss industrial life experienced one of its greatest periods of expansion during the years 1914 to 1918. Factory additions were numerous and output greatly extended. But similar to our own national depression which took place in 1920, and due to much the same causes, Swiss industrial life experienced a sudden and universal slump beginning with the year 1921, resulting in falling prices and a rapid curtailment of working forces. Prices at the beginning of this period of depression are estimated to have been approximately 160 per cent. higher than in 1914.

That the present situation is due wholly to external condition of trade is aptly illustrated by the fact that only some fifteen per cent. of the entire production of one large manufacturer in normal times—except that of the foundry, fifty per cent. of this going into internal consumption—goes into home trade. Present activity,

(*Continued on page 74*)

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In Your Plant

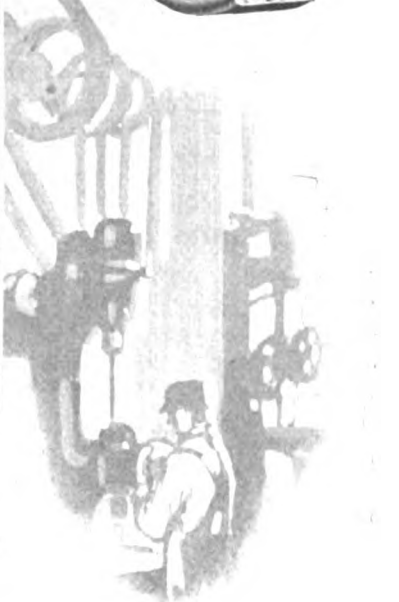
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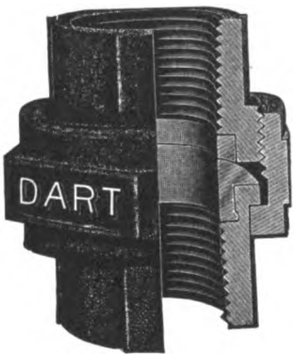
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Wasting steam means higher costs and lower power. Dart Unions eliminate waste and eradicate losses because they are absolutely steam tight.

Dart Unions are guaranteed to be absolutely leakproof because they have bronze to bronze seat rings, machined to a true ball joint and properly ground together with oil and corundum, assuring a positive joint. Heavy pattern throughout. Dart Unions are adapted for both high and low pressure. Pipe threads are Brigg's Standard—easy to fit—and require no packing.



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Every valve user will appreciate the freedom from worry and expense which distinguishes Jenkins valve service.

Made to provide years of trouble-free service, the convenience and operating economy of Jenkins Valves are emphasized when it becomes necessary to repack a valve or replace a part.

***Then* the accessibility, the low cost of replacements, and the speed with which replacements can be accomplished, all demonstrate the great economy of standardizing on Jenkins Valves for all lines.**

Valves in bronze, iron and steel for practically every requirement. At supply houses everywhere.

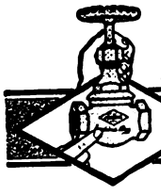


Fig. 325, screwed, Jenkins Standard Iron Body Gate Valve.

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Always marked with the "Diamond"
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(*Continued from page 72*)

or lack of activity, thereby bears a direct relation to conditions of the world's markets. The only direction in which this depression has not thus far been felt lies in the electrical field, such as in railroad equipment, and in some lines of the textile and chemical markets.

The great success attending the introduction of the Diesel type engine, due to its economy in working, has aroused interest in recent years. The first experimental Diesel engine was built at Winterthür in 1896 and manufacture, on a large scale, was taken up in 1903.

We only wish to mention in very brief form, before closing, the chief sources of competition experienced by the Swiss industrial at the present time, chances for export trade to this country, and government aid given the unemployed.

With respect to the first point mentioned, it can be disposed of by stating that the Swiss industrial, like his brother industrials all over the world, is experiencing the greatest competition in manufacturing at the present time from the "bogey" man of the world, namely the German industrial. This intense competition has been possible, in particular as applied to the Swiss manufacturer, because of low rates of exchange of the German mark, cheap labor conditions in that country, and a system of industrial cohesion unsurpassed in the world. While this uneconomic condition in the German field exists, few industrials of Europe can hope for a permanent stabilization of their own industry. Next in line of competitors comes the industrials of Belgium and Holland.

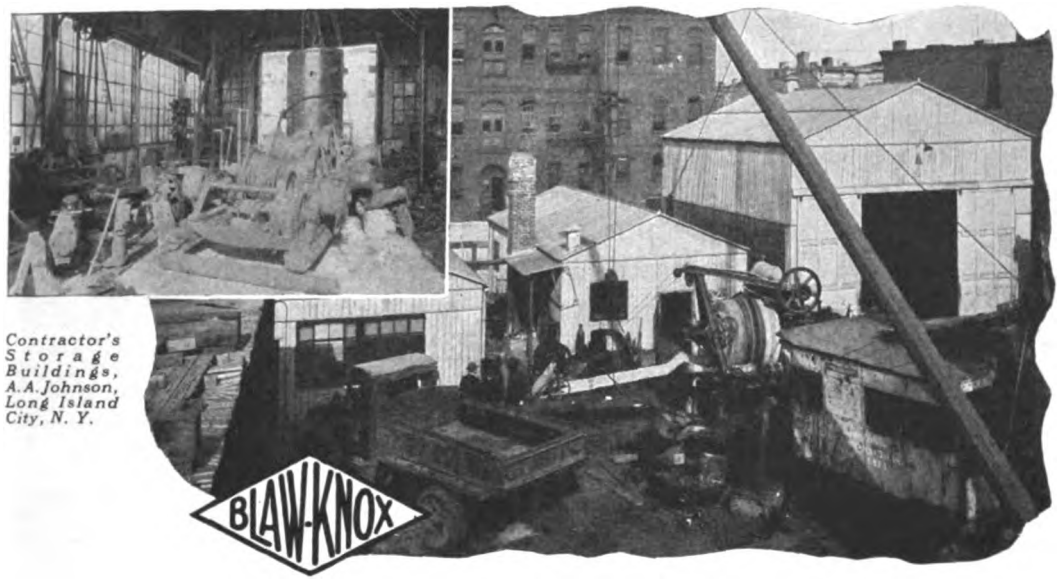
Even less can be said perhaps with regard to possibilities for export trade of Swiss manufactured products to this country. The main stumbling block in the way of export trade to the United States lies in our much maligned tariff bill recently made into law and known as the Fordney-McCumber tariff bill. The final word is said when it is recalled that under this law, duties on all kinds of machinery have been doubled.

The system followed in Switzerland since the ushering in of the period of depression in 1921 for the aid of the unemployed is one of the finest and most comprehensive instituted in any country of Europe today. Every Swiss unemployed receives a weekly stipend averaging seventy per cent. of his normal wage. A governmental law has decreed that one-third of this unemployment dole be paid by the company, one-third by the Federal Government and the remaining third by the local township. In fact the system has many points in similarity with that now in force in Czecho-Slovakia, although the aid given in the former country is considerably greater. If a man is working on part time his unemployment dole is based on 70 per cent. of the wages he would receive if working during the days unemployed.

Perhaps sufficient has been said to give the reader a basic idea of industrial conditions in this little landlocked republic. While present world economic and competitive conditions argue against a rapid return to normalcy, the Swiss industrial can still lay claim to the one basic factor which has made his products one of the best in the world—namely, superior and better workmanship than most of his competitors. And in possession of that quality he can still lay claim to a very reasonable hope for a future recrudescence of pre-war prosperity.

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Contractor's Storage Buildings, A.A. Johnson, Long Island City, N. Y.

A Blaw-Knox Building makes the most Modern and Economical Type of Warehouse

Blaw-Knox buildings possess every quality demanded of the modern warehouse. They are firesafe, weather- and distortion-proof, well-lighted and ventilated; they are good-looking and substantial.

In addition to these qualities, Blaw-Knox buildings are very quickly erected. You can get exactly the building you want, up and ready for occupancy, within a comparatively few days. Blaw-Knox buildings are erected from structural steel framing and pre-fabricated galvanized steel units (**the time-tested, rust-protected metal**). They are shipped direct from Blaw-Knox factories. They can be enlarged through the use of additional standard units or they can be dismantled and re-erected in a new location with little trouble.

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A Line Worth Knowing!

THE "C-M" Line of Overhead Material-Handling Equipment offers a wide range of products designed to meet practically every overhead material-handling requirement.

Some of the famous "C-M" products found in industrial plants, warehouses, railroad shops, foundries, and machine shops, everywhere, are

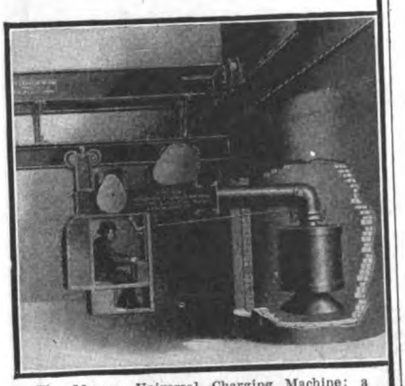
"C-M" Electric Hoists
"Cyclone" Chain Hoists
"C-M" Chain Hoists
"Matchless" Trolleys
"C-M" Overhead Track Systems
"C-M" Traveling Cranes
"Morgan Universal" Charging Machines
"C-M" Mast and Jib Cranes
"C-M" Winches

The illustrations on this page are photographs of typical installations in which "C-M" products are doing the job for which they are built: reducing labor costs and speeding up production.

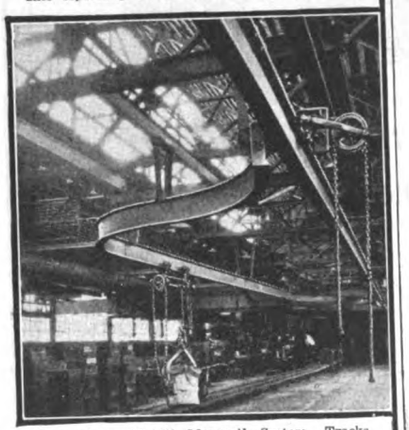
To those who are contemplating the addition of new material-handling equipment or to those who are seeking advice and cooperation on any material-handling problem, the services of our engineers are offered without obligation.

Our complete catalog and bulletins on all "C-M" products will gladly be sent upon request.

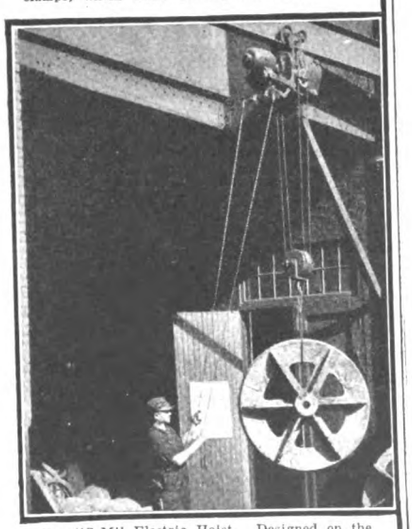
THE CHISHOLM-MOORE MFG. COMPANY
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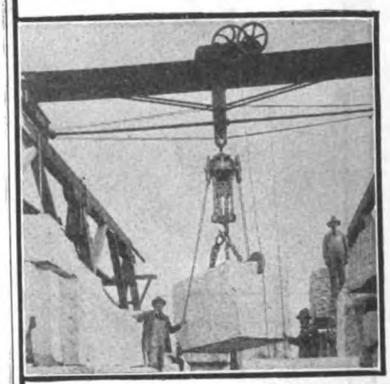
The Morgan Universal Charging Machine: a highly efficient overhead material handling unit especially designed for foundry use.



Part of a "C-M" Monorail System. Tracks are fastened to supports by C-M adjustable clamps, which make drilling unnecessary.



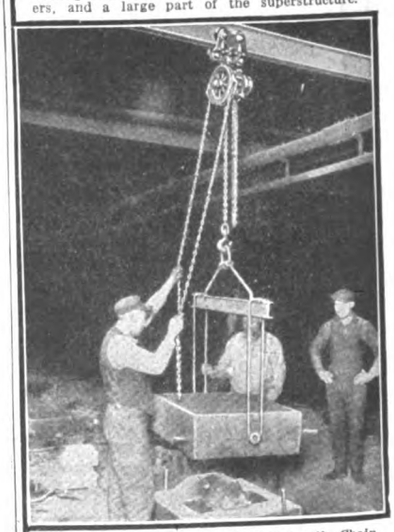
The "C-M" Electric Hoist. Designed on the principle of *the fewest possible things to get out of order and those easily fixed if they do.*



"Cyclone" High Speed Chain Hoists from ¼ to 40 ton capacity meet every overhead material handling requirement.



A typical "C-M" Overhead Track System, including straight tracks, curves, switches, hangers, and a large part of the superstructure.

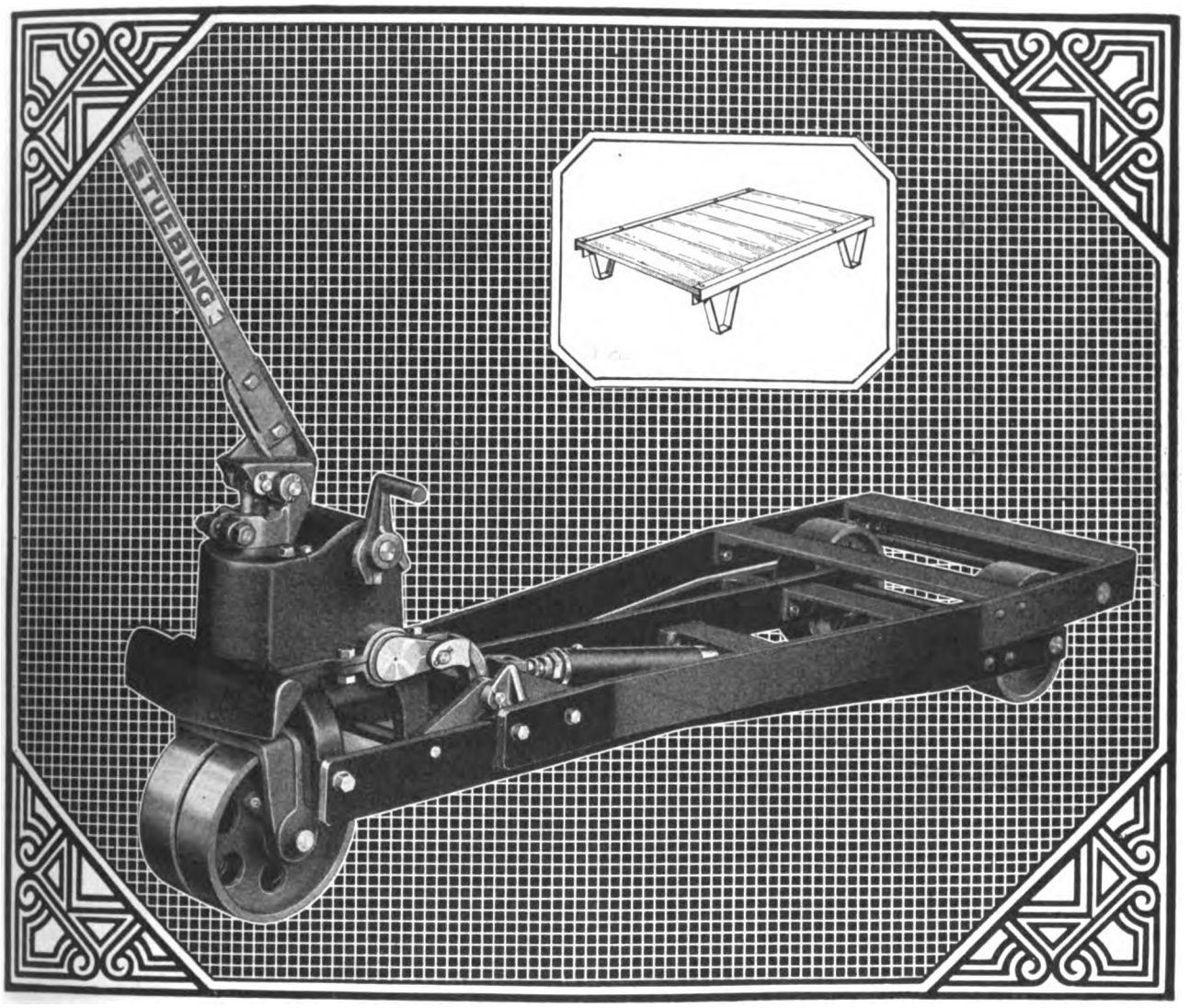


"Matchless" Trolleys and "Cyclone" Chain Hoists are built in a wide range of sizes and capacities to meet every individual requirement.

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OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

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Stuebing lift trucks supply a complete modern system of interior transportation—the most effective method yet devised for fast, orderly and economical handling of raw, semi-finished and finished stock. Stuebing lift trucks and "Steel Bound" platforms quickly pay for themselves through the dollars they save by speeding production, cutting costs and stopping waste in stockroom, warehouse and factory. Write today for booklet and list of successful users in your line. The Stuebing Truck Company, Cincinnati, Ohio; and Cornwall, Ontario. Branch sales offices in all principal cities.

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The Merit System of Education

(*Continued from page 34*)

district; a chief examiner and nine associates for the other. Chief examiners must have at least seven years' experience and associates must have at least five. All necessary expenses connected with the holding of examinations are borne by the association, but no member of the educational department or examining board receives any remuneration for his services.

The course of study is based on a text book which is chiefly a compilation of data and questions, prepared especially for the purpose. This text is used as a guide to what the student should learn and must be supplemented by various sources of information. Answers to questions in this book must be written and submitted to the educational department and the student must make an average of eighty on these papers before being admitted to final examination, except in cases where the educational department may consider the knowledge and experience of the applicant sufficient to permit him to take a written and oral examination direct.

Classes meet in two-hour session one evening a week, usually in local high schools, and are taught by men prominent in their profession. Classes in mathematics are sometimes taught by high school instructors in this subject.

On completing one branch of the course, the student makes application for an examination and if he is found to have completed the work satisfactorily, he is notified when and where to appear for examination.

Examinations are oral and are conducted by at least five examiners, all of whom must agree that the applicant is fully qualified before he is granted a certificate of merit. As some students always get "stage fright" when about to take an examination in any subject, our examiners are careful to put the applicant at ease before proceeding with the examination.

An applicant who has had no technical training, but who has had sufficient experience and who is known to be a qualified practical engineer, may appear before the examining committee for an oral examination only, and on answering all questions satisfactorily may be issued a certificate of merit marked "practical."

It is estimated that five or six years' study will be required of the average engineer to complete the course in all its branches.

The cost of the course is $6, half of which is for the text book and is paid at the time of enrolling; the other $3 is paid when the student comes up for examination.

Prominent Engineers Take Course

The plan was introduced little more than one year ago, yet about sixty certificates have already been issued and a total of 287 students are now enrolled in the various subjects. It is expected that the enrollment will reach 350 or more by spring.

So highly thought of is the course of study, and so highly prized is the certificate of merit granted to those who complete it, that many of the most prominent engineers of the state have already completed the course and have been awarded certificates certifying that they are qualified to take any stationary engineering position. Among these are the chief engineers of many of the largest plants in the state, some of whom have had as much as twenty-five years' experience since taking their college degrees. These men, naturally, were able to complete the course in less than the average length of time, but they were required to go over it and stand an examination, nevertheless, and they declare that they derived much benefit from it. Others who have reached the age of sixty or more are now enrolled for various branches of the study.

Employers have been quick to recognize the benefit to them of such a plan and have coöperated heartily with us in every respect. Mr. John L. Lovett, general manager of the Michigan Manufacturers' Association, for example, has expressed his belief that the association, "has taken one of the greatest steps forward for benefiting their members that has been taken by organizations of employes and professional men in the United States," and has called on our employment bureau from time to time for "certified" engineers.

The management of a large new building was intending to employ a steam engineer, an electrical engineer, and a refrigerating engineer, all at modest salaries. We recommended a supervising engineer, qualified to take complete charge, instead, and he was given the position. While it is necessary to pay such a man a fairly high salary, the expense is not so great as employing several ordinary engineers at small salaries. At the same time, the possibility of working up to such positions gives others an incentive to improve themselves and raises the standards of the profession generally.

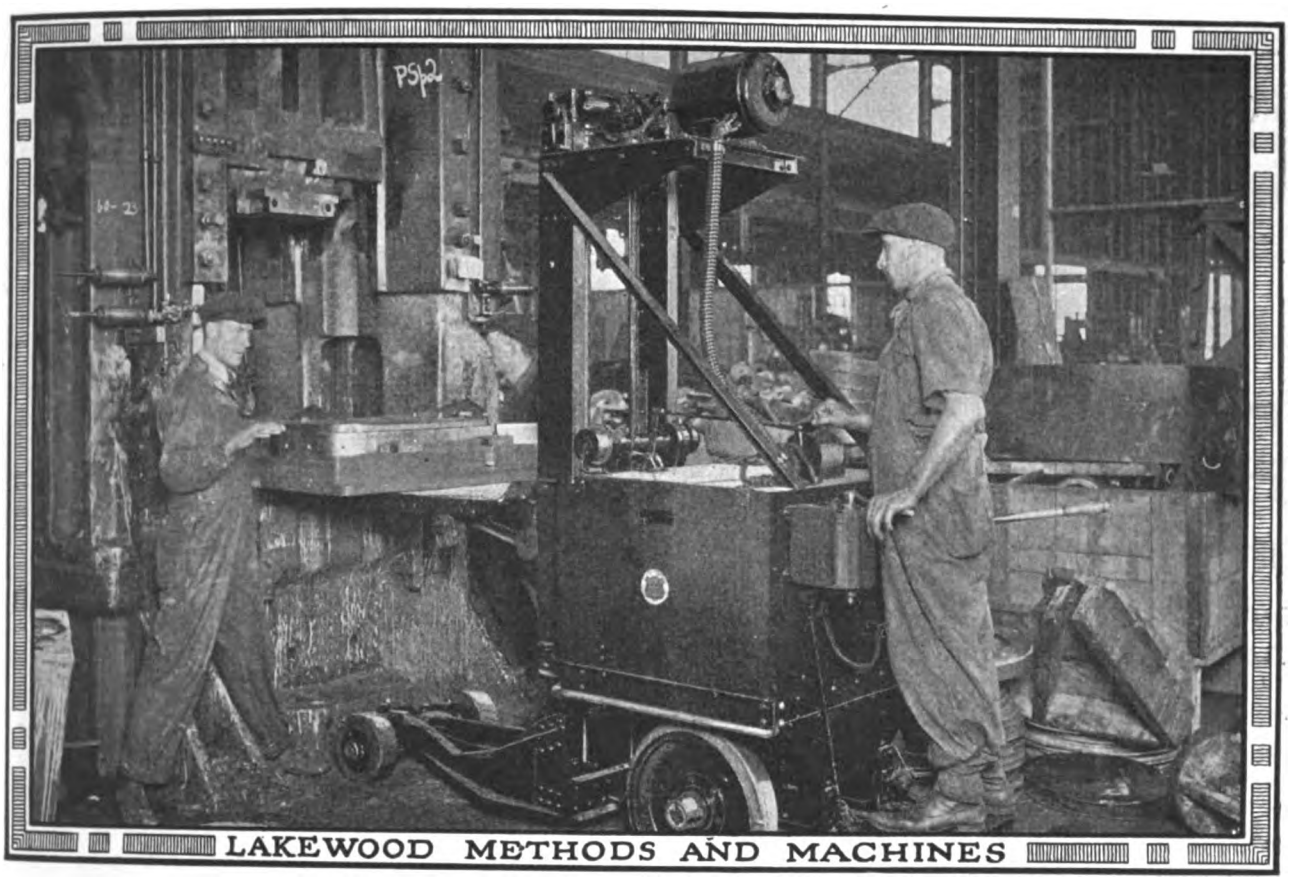
In another case, a man who is quite proficient as a steam engineer, but is rather weak on electrical engineering secured the position as chief engineer of a large downtown office building that was in course of construction. For his own good and for the good of the profession, our committee told him that he would have to get down to work on the electrical branch of our course so as to be thoroughly qualified to fill this responsible position, and he is now taking the course.

There have been cases where men holding minor engineering positions have thought so well of their knowledge and experience that they were under the impression they could go before the examining board and secure a certificate of merit without the trouble of taking the course of study, and have found that they didn't know nearly as much as they thought they did. Such men usually learn a lesson that prompts them to begin studying.

Many a new plant has been ruined by incompetent engineers and employers have learned that they are not safe in turning their plant or any part of it over to a man just because he has a license as a stationary engineer. When the Michigan State Association of the N. A. S. E. grants a certificate of merit to any man, that man is fully qualified to take a position in that branch or branches of stationary engineering in which the certificate is granted. Unlike the merely licensed engineer, he is not necessarily qualified to take just any position as a stationary engineer, unless he is a certified supervising engineer, but he is qualified to take a position as a steam engineer, an electrical engineer, a combustion engineer, or whatever his certificate of merit specifies.

The success of the Michigan State Association has elicited inquiries from many other state associations and plans are already under way for introducing the system in several states.

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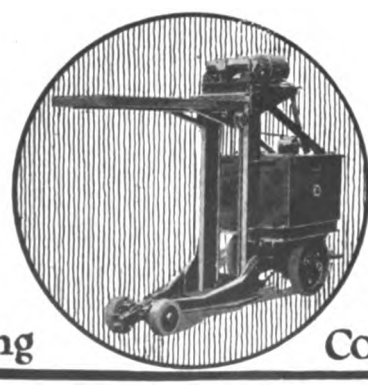
If You Handle Heavy Dies

you'll be interested in a Lakewood Tier-Lift.

Although it's a fact, you'll perhaps find it hard to believe that an automotive manufacturer has made a $12,000 reduction in his costs of handling dies. A job that used to take four men 3½ hours is now done by three men in 10 minutes with a Lakewood Tier-Lift Truck.

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Even Up in "Nigga' Heav'n" the F.H.P. Motor Plays a Leading Part

IN THOUSANDS of projecting rooms—high above the heads of the "gallery gods"—you will find Dumore fractional horsepower motors working shoulder to shoulder with busy motion picture projectionists. Evenly and smoothly they deliver the power that gives life to the antics of Chaplin or to the pathos of La Marr. Swiftly and surely they rewind reels so that film may be screened again and again. Thus the operators have more time for more important tasks—enabling all of us to enjoy our "movie" with greater certainty and safety.



Type-SAX

⅓ h. p. motor with special base. Nickel plated. Operates on A. C. or D. C.



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⅓ h. p. Cast iron frame. Enamel finish. Babbitt bearings, wick oil feed. Operates on A. C. or D. C.



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⅛ h. p. Cast iron frame. Enamel finish. Plain bearings, grease cups. Operates on A. C. or D. C.



No. 3GM—Stripped

¼ h. p. Aluminum frame. Enamel finish. Norma bearings, ventilated. Operates on A. C. or D. C.

As we have served the manufacturers of various motion picture machines, so may we be able to serve you. If you are developing a motor driven device, tool or appliance and find a perplexing power problem retarding its progress—or if you are a manufacturer planning to change the power unit you are now using, a word to our Engineering Department will bring you suggestions from experts, *free*. This Department—specializing in applying fractional horsepower motors to new and unusual uses—will be glad to work out your difficulty for you. Write any time—we're at your service always.

WISCONSIN ELECTRIC COMPANY
70 SIXTEENTH ST. RACINE, WISCONSIN

Dumore
Fractional H.P. Motors

Cooling Death Valley

(*Continued from page* 19)

the flats. But one serious difficulty has been encountered in mining these salts; this has had to do with the prevailing high temperature and low humidity. During the summer months of July, August and September a daily temperature of 130 degrees in the shade is a frequent occurrence, while as late as November a temperature of 80 to 90 degrees is to be expected.

The hardships encountered in working open faced mines under these climatic conditions are easily appreciated. Wide variations in human efficiency are to be expected. From the standpoint of temperature effect on production, conclusions arrived at by the New York State Committee on Ventilation are of primary value. It is shown, for example, that the actual output of the worker must be directly effected by the atmosphere to which he is subjected. Increasing the temperature in a room from 68 dgrees to 75 degrees might be accompanied, it is claimed, by a decrease in amount of work performed amounting to 15 per cent., while a further increase to 86 degrees might cause a decrease of 37 per cent.

From what has gone before, it is perhaps evident that the intensity of living and working conditions in this desert area must be extreme. From this has followed the desert law that whatever is done here must be done better than anywhere else.

First step in this direction was taken recently by the Pacific Coast Borax Co. At a distance some fifteen miles from Death Valley Junction is a borax mining station of this company consisting mostly of bunk houses, with the usual company kitchens, rest-rooms, pool rooms, restaurants, etc. Approximately 500 persons are living at the station. Because of the conditions already noted, officials of the Pacific Coast Borax Co. recently decided to install mechanical apparatus for cooling, humidifying and cleansing the air throughout the station grounds. This equipment consists of nine large and four small multiblade fans, several thousand feet of heater surface, and four double bank spray type air washers.

The construction and operation of the air washer is exceedingly simple. The air is drawn through a spray chamber, where it comes into contact with a minutely atomized spray of water. A large number of spray nozzles are used and evenly spaced in the chamber, insuring an even distribution of mist. The mixture of the spray and air is very thorough, so that every particle of dust is made wet and heavy by the spray.

The evaporation of a portion of the spray water humidifies the air and the amount thus evaporated depends upon the despoint desired. When it is necessary to heat the water, the system of humidity control provided insures a simple method of heating. In the summer months the air is cooled by one of two different methods. First, where a system of recirculation is used, the air is cooled by evaporation; that is, the heat necessary to evaporate the water is extracted from the air. This gives the greatest cooling on the hottest days. The second method of cooling is to use cold water in sufficient quantities in order to obtain water condensation, thus lowering the humidity.

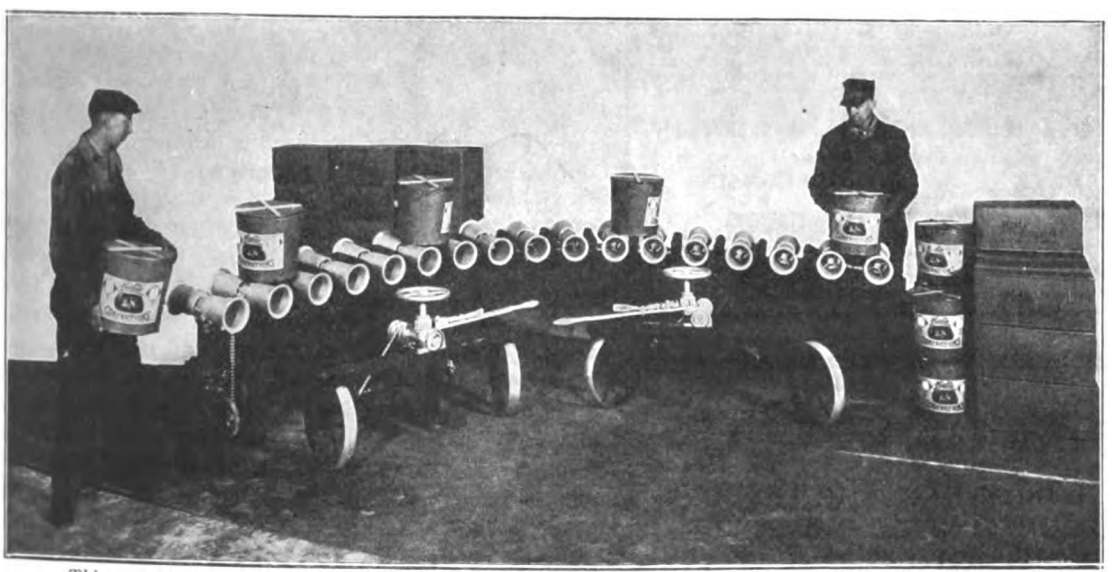
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This cut shows only one 14' section. Any number of connected sections can be used together.

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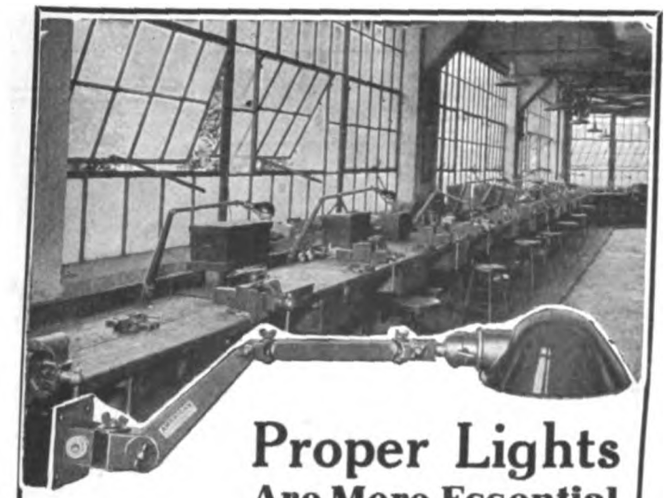
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Rotary Pumps and the Handling of Liquids

(*Continued from page 17*)

from the driven gear. The liquid is taken in by suction on one side of the pump, as indicated by the arrow, and due to the rotation of the intermeshing gears in opposite directions, the liquid is discharged through the other opening.

In Fig. 2, a pump consisting of an eccentric shaft working in a circular pump chamber is shown. A piston C is mounted on the eccentric B; when the shaft A is rotated, the eccentric B also rotates. The piston C does not rotate, merely being "swept" around the cylinder, having only a clearance of .001" with the pump chamber. Discharge and suction are taking place during nearly all of the period of rotation of the shaft, there being only a slight pause, during which pause the check plate E prevents pumped liquid from slipping back into the pump chamber.

Somewhat similar in design is the pump in Fig. 3. Here the piston "sweeps" through the cylinder, actuated by an eccentric. The liquid, however, is prevented from returning during the pause in effective pump action by the ports in the box-like section marked 1. This part is moved by the piston so that the discharge port 2 is open only when the pump is discharging.

The drawing in Fig. 4 shows the mechanism of the screw pump. The pump consists of two moving parts —two horizontal, parallel shafts, having two sets of screw threads on each. The threads on the two shafts intermesh in pairs so that the liquid is trapped at each end of the pairs of screw threads and forced toward the center. This action entirely eliminates any thrust or any end pressure on the shafts and assures a continuous flow of liquid, while removing the expense of providing and maintaining a thrust bearing on the unit. One of the shafts is connected to the shaft of a motor and the other intermeshing shaft is geared by enclosed double helical pinions running in a bath of oil.

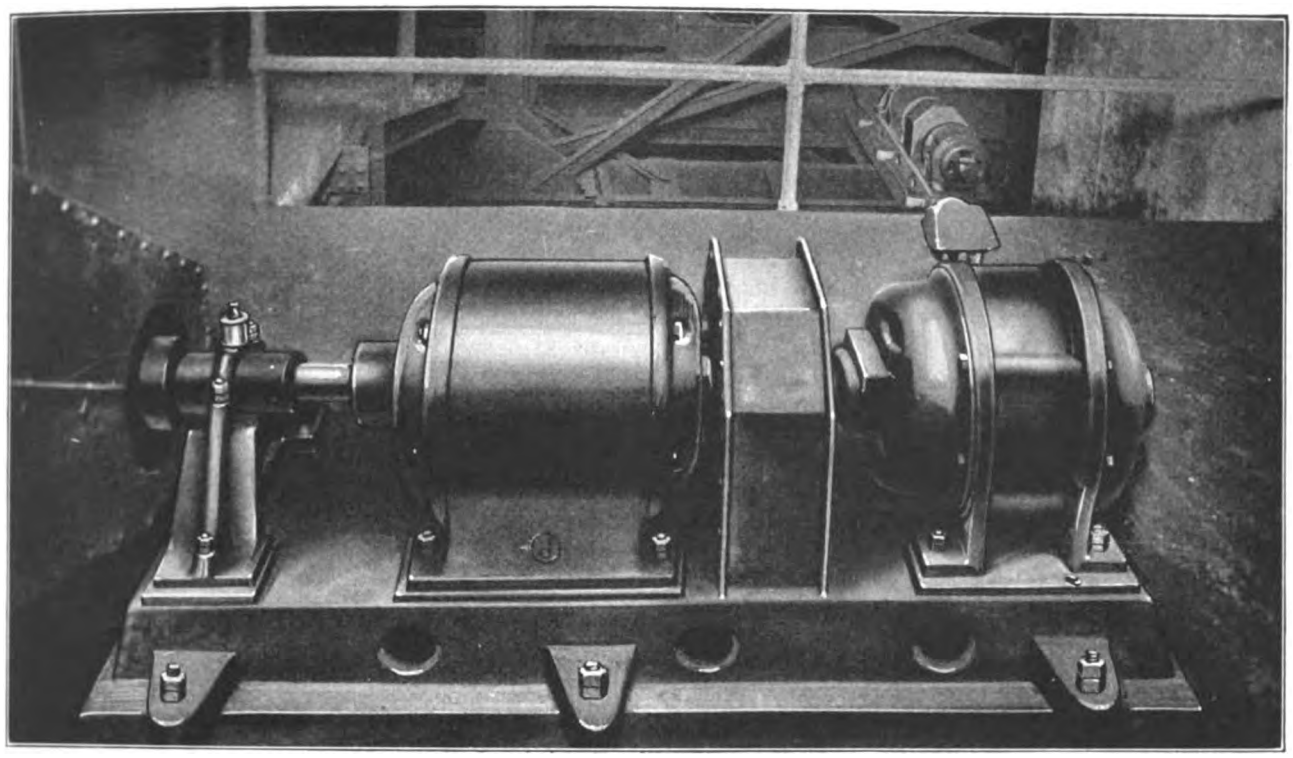
There are no valves or internal packing nor small moving parts. The shafts pass through stuffing boxes at each end of the pump, but as these boxes are on the suction side of the pump, little difficulty is experienced from this source.

Most rotary pumps work without pulsation or vibration and those that have this qualification are most desirable for handling the more viscous liquids. The screw pump has been used for handling paraffin wax, which is so viscous at normal temperature that it is necessary to steam-jacket the pump.

The geared type of rotary pump is one commonly met with in every form of industry. Many large engines employ such pumps driven directly through gears or belted or chain driven from the main shaft for handling lubricating oil in the circulating system. Such pumps are often used in the handling of syrups and molasses in the sugar industry.

A small rotary has been adapted to hand power for especial application to emptying barrels. The photograph on page 17 shows this type of pump emptying a barrel of varnish into a vat, preparatory to a dipping process. A pump like this can be carried about easily and used wherever necessary and with only a moment's work to install it ready for operation.

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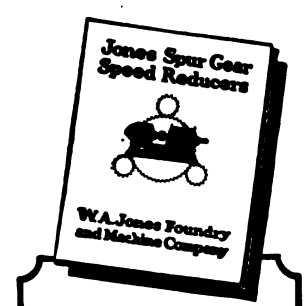
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What Machine Switching Does for the Telephone Service

(*Continued from page* 31)

saved the trouble of "listening in" on the connection to ascertain the state of affairs. Machine switching is simply a final and logical step in the orderly progress of reducing the dependence on the human element in establishing telephone connections. The term "reducing" the human element is used advisedly for even so it cannot be entirely eliminated.

In introducing the new automatic or "machine switching" system, the principal objective is not so much one of economy of operation (which will probably not be secured for reasons pointed out later on) but rather to create a condition which will make uniformly good service possible under all conditions. For instance, during the war period when everything was of necessity subordinated to war activities, it was impossible to keep up the standard of service with the rush of all kinds of help to war industries.

Even now since conditions have become normal again, certain emergencies, such as heavy storms, sudden severe thunder showers, a flurry in the stock exchange, etc., are liable to cause a sudden increase in the demands on the telephone system which, in spite of the most careful foresight and elaborate organization, are liable to cause temporary deterioration of the service.

Consequently it is evident that the more nearly automatic and independent of human aid the functioning of the telephone system can be made, the more uniform the quality of the service will be. Under normal conditions the service will not be appreciably superior with machine switching than with manual switching but under abnormal conditions it should be better.

It should be borne in mind, however, that, although the introduction of machine switching simplifies the problem of rendering service and makes it possible to keep up to a more nearly uniform standard under all conditions, the first cost and the maintenance of the complicated apparatus not only in the machine switching office itself but in the manual offices with which it must operate, are so high that the increased carrying charges pretty well off-set the saving in operators' salaries. On the other hand, the reduction of the human element thus secured may nevertheless act to lessen the rising cost of furnishing telephone service because future increase in cost of labor will probably not have the same controlling effect as would be the case were manual operation to be continued entirely.

To change over an elaborate system which has already been developed to such a very high degree as the telephone is a stupendous undertaking and can only be accomplished during the course of many years. There are about 1,000,000 telephones and 90 exchanges in New York City alone, excluding its tributary territory immediately adjacent in New Jersey, and it is estimated by the forecasting engineers that this will be doubled by 1940.

The fact that there is an improved method of operation which can be resorted to should not be taken too much for granted. The perfecting of a method of mechanical switching which is not only satisfactory in itself but which can be sandwiched in with existing manually operated exchanges was a matter of years of experimental research and development. After carrying on this work in the laboratory as far as possible, it was tried out in a small way on an intercommunicating system; and later on three complete central offices in Newark, N. J., were equipped with machine switching on a semi-mechanical basis where the operators did the "dialing," or its equivalent, so as to try out the new apparatus under service conditions without disturbing the public, before any attempt was made to try it even in one district in New York City.

In addition, machine switching had demonstrated its usefulness in several small cities requiring but one exchange. It was only in this way that prohibitively expensive mistakes and demoralization of the service could be avoided. It is a good example of the modern method of gradual development from an idea to an accomplished fact, by means of experimental research.

Having a system to go ahead with, the next problem was how to put it into operation. The only way was to follow the same deliberate and cautious method. There are something like one hundred and fifty telephone exchanges in the metropolitan area of New York and it does not take much imagination to realize the utter impossibility of changing over all these in the course of a year or two. It will more likely take ten or fifteen years and in the meantime the population is increasing so fast that new exchanges must be opened at frequent intervals. It is not only a question of making the equipment, installing it, paying for it and training a personnel to maintain it, but the public must be educated how to use it. In spite of the simplicity of using the dial to obtain a number there is bound to be a certain amount of awkwardness on the part of even the most intelligent users at first.

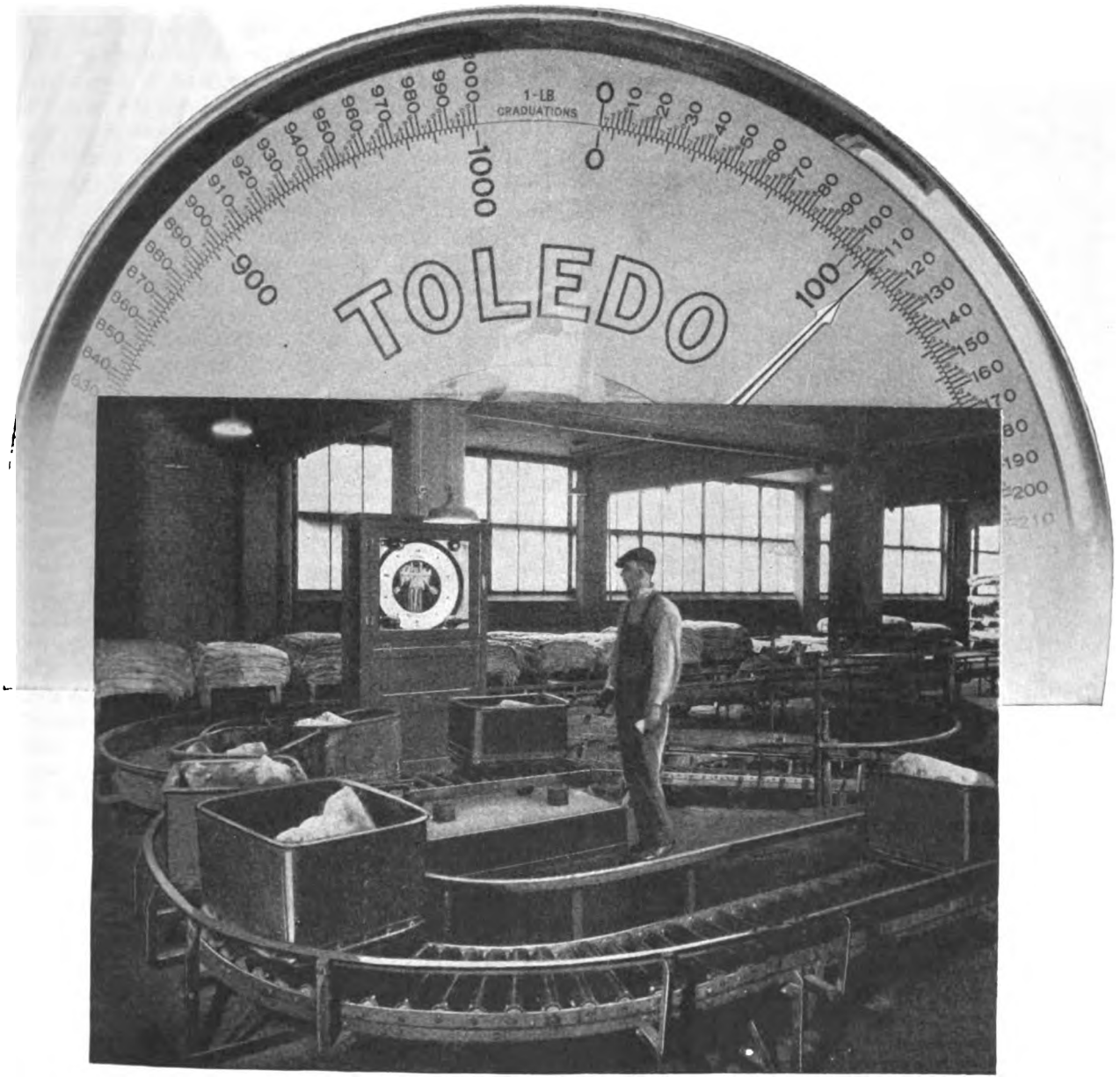
The sequence in which the machine switching will be installed in the exchanges of any large area such as that of New York City depends upon the result of several engineering studies relative to each district and takes into account to no small extent the forecasting studies described in a previous article in the November, 1924, issue of INDUSTRY ILLUSTRATED. In general, machine switching would be installed where actual or expected growth makes relief for the old system necessary; but this would not always be the case. For instance it may be that the building in which the exchange is located is not well adapted to the installation of machine switching apparatus or that the manual equipment is still in too good condition to be relegated to the junk man without unjustifiable losses.

There is also another consideration which is very interesting because it shows the manner in which the telephone service is made use of under different circumstances, and also because it shows how the introduction of new apparatus and new methods brings with it new viewpoints and new considerations.

For instance, the telephone traffic engineers have developed what they call the "calling rate load curves" shown in Fig. 3. These show the traffic density, or number of calls handled, at different hours of the day under normal conditions. Curve "A" is fairly characteristic of a residential district where the calls start to increase early in the morning, work up to a maximum between 10 A. M. and 6 P. M. and then fall off. There is also usually an evening peak load in residential districts between 8 and 9.30. Consequently the load is

(*Continued on page* 86)

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Here is shown a Toledo Automatic Scale checking the weight of materials. The ingredients used are weighed out independently and thrown into the steel baskets as they pass along the conveyor. The weighman at the checking scale sees that the weight of each basket is the known and predetermined amount. After passing this inspection, the baskets are sent down a special roller into the mixing room.

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(*Continued from page 84*)

fairly constant, so that the equipment is busy earning money for a considerable period of reasonable uniformity. Curve "B," on the other hand, is characteristic of a business district where the load does not come on until 9 o'clock in the morning, increases with great rapidity, falls off during lunch time and then has another "peak" after which it again falls off very rapidly. On Sundays and Saturday afternoons there is practically no business in such exchanges. From these curves it will be seen that office "A" is using more of its equipment for a longer part of the day than "B." As both offices have about the same maximum load they would both require the same amount of equipment. Consequently, from the standpoint of economics, it would be better to initially install machine switching for "A" than for "B."

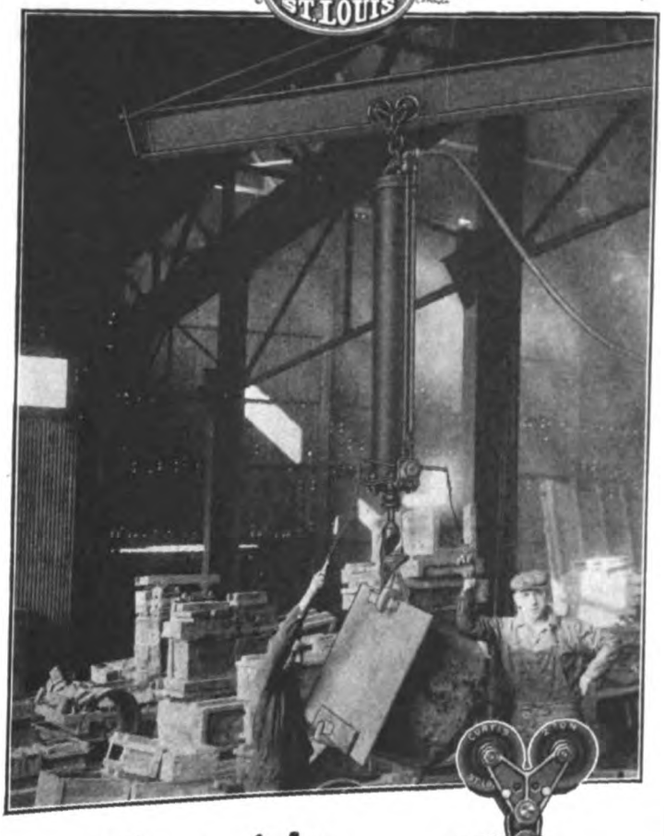
The underlying reason for this is, of course, that with manual operation, where a large proportion of the operating expense is operators' salaries, it is possible to reduce costs during slack periods by not having operators on hand; but with machine switching when the investment has once been made, the carrying charges go on at about the same rate whether the equipment is used or not.

This reasoning, it must be borne in mind, has to do mainly with the sequence in which it is best to carry out the changes when once decided upon, and even then is not necessarily controlling because it is in the "B" type of exchange where those unforeseeable flurries are most likely to occur which cause temporary dislocation of the service. In other words, all these various conditions, and others besides, must be carefully weighed before a final satisfactory decision can be reached.

Although the change to machine switching in the New York area is being made as rapidly as circumstances warrant, an increasing number of girl operators will be required to take care of the continuous growth of population and business. Even when the change is complete, a large number will be required for toll service and the general assistance of telephone users in supplying information and all the multiplicity of activities incident to maintaining this vastly important public service. It is to be noted that the dial on every machine switching telephone instrument has a point marked "operator" which is likely to be used at intervals for a variety of purposes. Nevertheless the introduction of this system will ultimately greatly simplify this part of the labor problem, although of course the personnel required for the maintenance and construction of the continually increasing inside and outside plant must still be retained and augmented in the future.

A further interesting detail of changing over from one method of operation to the other is the campaign of instruction carried on to educate the users of the telephone how to use the dial. Although the use of the dial is a simple matter, yet the telephone company takes every precaution to insure that it is thoroughly explained to all subscribers. Explanations are made in the newspapers just before the change, letters are sent to all subscribers inclosing a pamphlet, individual instruction is given by company representatives, lectures are given before civic organizations if possible, and finally at the last minute each subscriber is called on the telephone to advise him of the exact time that the change will take place. It all takes time.

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What Is the Measure of Labor's Value?

(*Continued from page* 15)

semi-skilled), must be producing more than his British or German or other European confrere.

In both cases, the answer is the same—machinery. Just as automatic and semi-automatic lathes, milling machines, drill presses, punch presses, and so on, made possible our war time production in spite of an acute shortage of men; so have cranes, conveyors, tractors, lift trucks, and a host of other types of materials handling machinery, made it possible to continue the tasks of common labor with but a fraction of the number of men formerly necessary.

The value of a man's labor is measured by its productiveness. Unaided, his labor today is worth pitifully little; supplemented by machines—which represent Capital—and directed and fitted into a complete scheme of production—which is the function of Management—his labor is lessened even while his reward is multiplied. These three elements—Labor, the worker; Capital, the tools and materials and machinery; Management, the guiding and directing intelligence—are the three angles of the industrial triangle. Without any one of them, the other two would cease to function.

More than anything else, perhaps, it is an appreciation of this truth that has held this country secure against the wave of radicalism which disrupted so great a part of the world. American labor has learned that machinery is not a device designed to put men out of work, but a device which both lightens labor's burden and increases its reward. The agitator may cry that Capital and Management are "exploiting" labor; that an unjust share of this increased productiveness goes to these two. There may be truth in the latter contention; but who is there, so impartial, so omniscient, as to evaluate correctly the contribution of each to the general result?

Whether we work with our hands or with our brains, we all labor; and the worth of that labor is not measured by its effort, but by its product. A man can work hard on a treadmill for ten hours a day, as in many parts of China, and create by that labor only enough to pay him a few cents per day; he can work eight hours, operating a machine which does the heavy work, and produce enough to pay him as many dollars; or he can work for hours, days, or years, with his brain —creating a machine or a method which will multiply the production and the earnings of thousands of others—and his work is proportionately valuable. Undoubtedly, the coolie on his treadmill puts forth the greatest effort. But he lacks the coöperation of intelligent direction, and he lacks the tools and machinery.

Take that same coolie, give him intelligent direction, and supply him with modern machinery. Instead of producing but a few cents' worth of work per day, his effort now produces many dollars' worth of work, and he no longer has to work so hard or so long each day. Capital and Management have stepped in, for without them he could not have accomplished the change. Are these two, then, not entitled to share in the result? For the measure of labor's value applies to the labor of management and to the labor of capital, as well as to the physical labor of men. And that measure, in every case, is the worth of the resulting production.

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WHEN Thomas A. Edison invented the nickel-iron-alkaline battery—which Dr. Steinmetz declared "does not age and has no definite life, but its life is limited, theoretically, only by mechanical destruction"—it was necessary to find a material strong enough to equal the long life of the elements.

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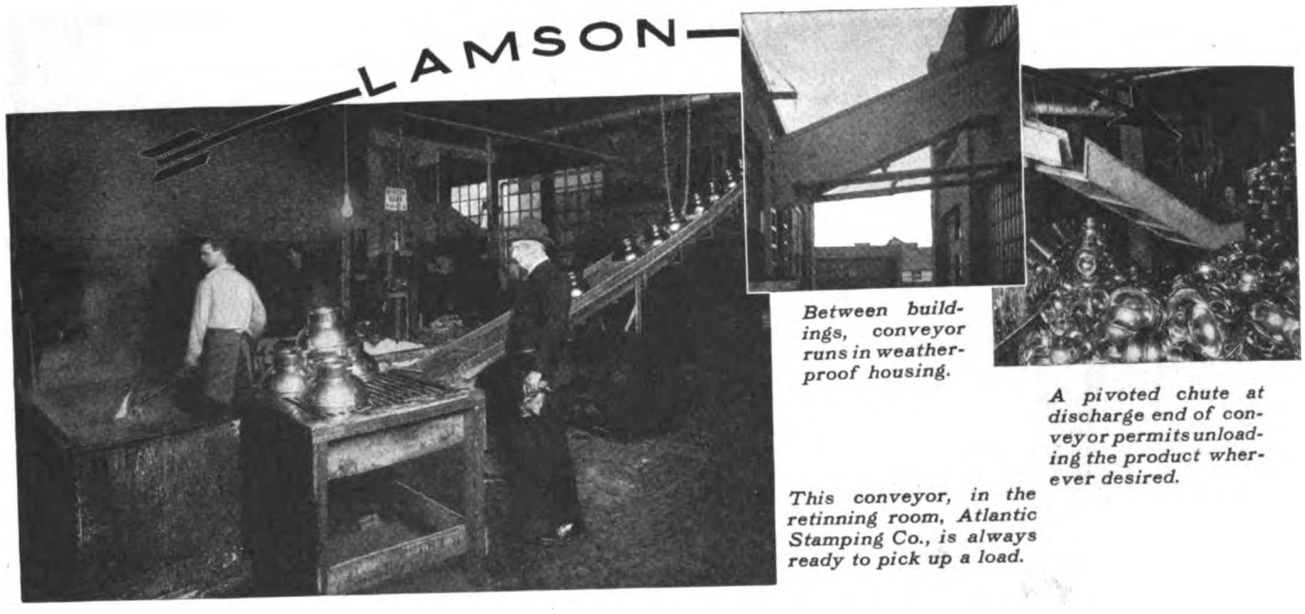
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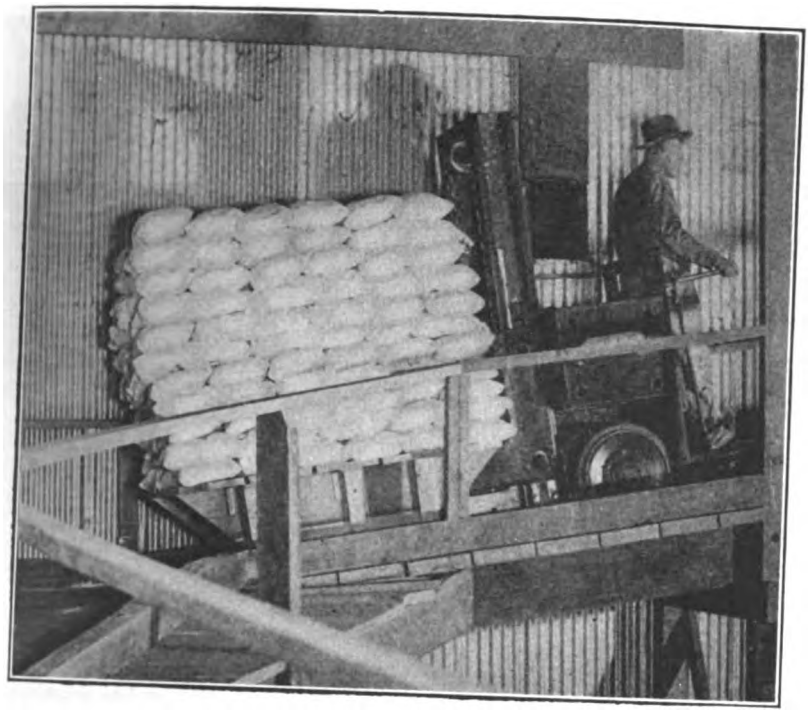
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Ask him what's in his battery box. "An Exide-Ironclad," he'll say. And plenty more he'll tell you if you'll listen.

Power! Power! Power! Plenty for the toughest kind of pulling, ready in an instant when the call comes. No matter what kind of electric industrial truck or tractor, there's an Exide-Ironclad Battery that will take it almost anywhere.

UP SHE GOES

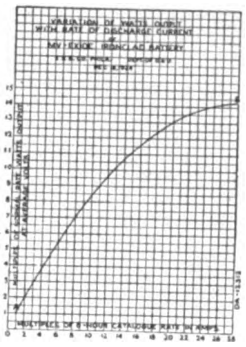
UP she goes, powered by an Exide-Ironclad Battery. In easy going this battery's normal, economical flow of current gives it speed and power aplenty. A ramp, a stretch of cobble—any sudden need for extra power—the Exide-Ironclad responds with a mighty flood of energy. It can deliver power at as much as *twenty-eight times* its normal level-going rate. A great reservoir of truck-driving energy, this battery saves time and trouble on material-handling jobs—and dollars, too.

On the last run of the day the operator has all the speed he needs, with an Exide-Ironclad in the battery box. Not only when the battery is new, but month after month, for years on end.

Even in the biggest truck or tractor, over floors and pavements that put the best equipment to the test, this rugged, rough-and-ready battery withstands the knocks and jolts. You'll seldom find it on the repair bench.

Men in charge of trucks and tractors equipped with the Exide-Ironclad Battery agree that recharging costs are exceedingly low. High power efficiency enables it to absorb current readily.

To save you the trouble of hunting up a truck operator for the close-up facts on the Exide-Ironclad Battery, we have put them all into a booklet. A postcard to us puts this interesting booklet, "Facts for Consideration in *Selecting a Battery* for Electric Industrial Truck and Tractor Service," on your desk. You might as well get the whole dollar-saving story. It places you under no obligation. Write today.



"A" indicates the power need in normal going. "B" indicates the enormous amount of power the Exide-Ironclad Battery is capable of supplying when the call comes — up to 28 times normal rate.



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How Conveyors Cut Distribution Costs

(*Continued from page 23*)

neath. We have also tied in these two drawings with a note showing the junction of conveyors on the first floor level with those on the floors above. In addition, we have marked the two diagrams with numbers corresponding to the figure numbers of the photographic illustrations, and the arrows on these numbers indicate approximately the direction the camera was pointing when the photographs were taken.

By studying the diagrams and the photographs, each handling operation can be clearly followed. First, is the unloading of cars which is done by means of gravity conveyors being placed within the cars. These conveyors feed the cartons to gravity or belt conveyors inside the building, depending upon the location of the cars on the siding. Building doors are so arranged that four cars can be spotted at one time on the siding, but only one car is unloaded at a time. All the packages

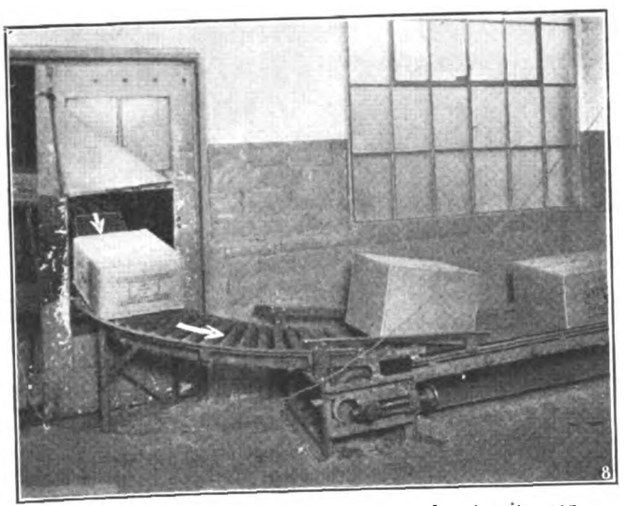


Fig. 8. Boxes are unloaded from cars by gravity conveyors passing through holes in the building doors. Illustration shows one unloading point.

unloaded are transported by conveyors which converge to a finger tray elevator which raises and automatically discharges them to the various floors upon which they are to be stored. Fig. 8 shows a gravity conveyor in the car and the packages passing through a door of the building. Fig. 4 shows the conveyors feeding to the finger tray elevator.

After the packages are raised they are discharged to gravity conveyors as shown in Fig. 5, but due to the layout of the building it is necessary to have a router stationed at the point shown in the conveyor line. (See Fig. 3.) This one man directs the packages to the various conveyor lines serving each part of the storage floor. As there are three storage floors, the company has installed a bell call system and electric enunciators so that the one router is able to serve all three floors. This is possible as the man who is stationed at the feed point on the finger tray elevator knows the floor on which the stock is to be placed, and by a system of levers he is able to control the discharge point. He, therefore, signals by means of a bell, warning the router to change floors, and after the change is accomplished the router signals back on the enunciator. The materials are then allowed to feed to the elevator.

Incoming packages are handled on the storage floors by gravity conveyors and chutes and from these conveyors they are taken by hand trucks and placed in stock.



Fig. 9. Hand trucks are used for several operations, such as distributing wooden boxes to the various storage floors to be used in filling orders.

This operation is clearly shown in Fig. 10. This illustration also shows the method of making a passage-way through the runs of conveyors which obstruct fire exits. The incoming packages are stored in cartons on the floor, as shown, and are not re-handled until the cartons are broken open, at which time the entire lot of shoes in each carton is placed in steel bins for the order pickers.

So far we have described the receipt of materials, and it will be seen that very few conveyors are required for handling the incoming packages. The larger portion of

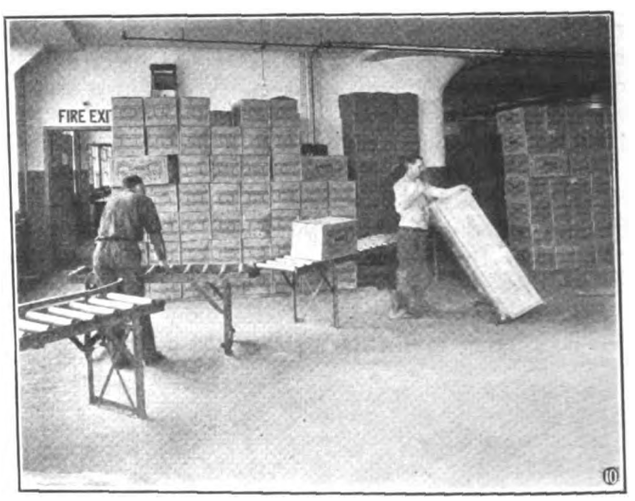


Fig. 10. A special two-wheel hand truck is used to transfer incoming cartons from conveyors to location on storage floor. Note how simple it is to break the conveyor run which blocks the fire exit.

the conveyors in this building are used for assembling, packing and shipping of orders. The general office is located on the sixth floor and from here orders to be filled are dropped by small gravity chutes to the various storage floors. In filling an order, the pickers select the stock from steel bins and place the individual boxes con-

(*Continued on page 96*)

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platforms absorb wear and tear instead of hammering it into the floor.

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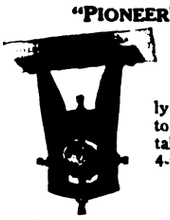
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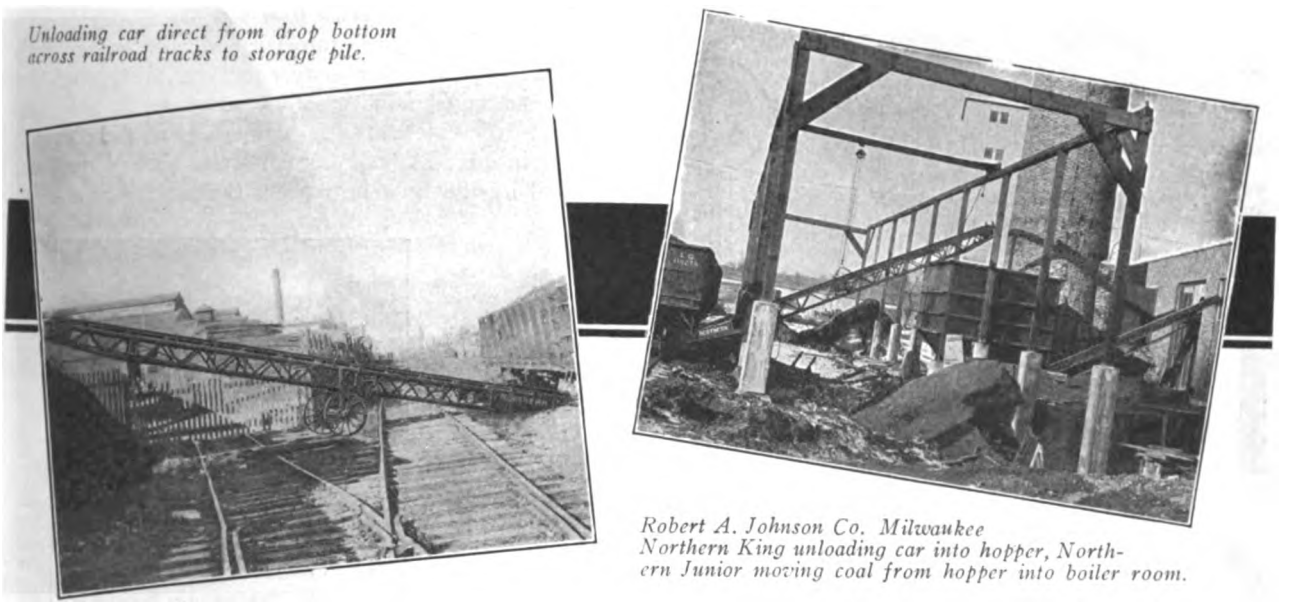




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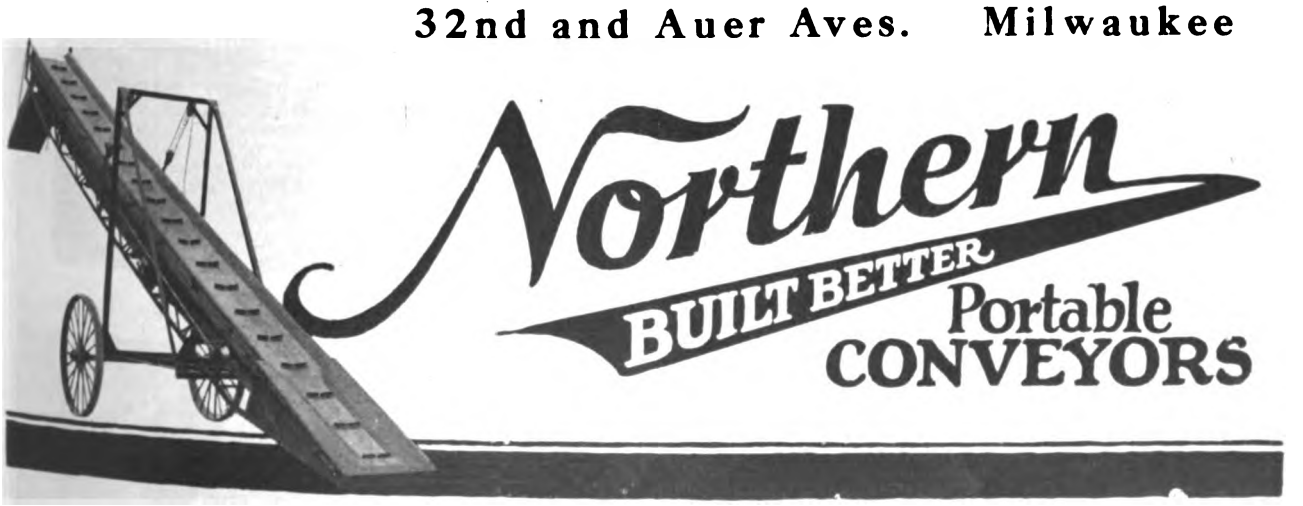
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(*Continued from page* 92)

taining a pair of shoes into large wooden boxes, which they move along on gravity conveyors. The steel bins are so arranged and the stock so placed in these bins that an order picker starts at one end of the conveyor, shown in Fig. 11, and his particular part of the order is filled by the time he reaches the turning point. Orders are split into two classes, known as express and local. Local orders mean those which have stock coming from all three floors in order to fill them, and express mean those that are completely filled on one floor. For the express orders, the power driven belt conveyors, shown on the floor in Fig. 11, provide a quick method of transportation and immediately carry the completed orders to the shipping floor, shown in Fig. 2.

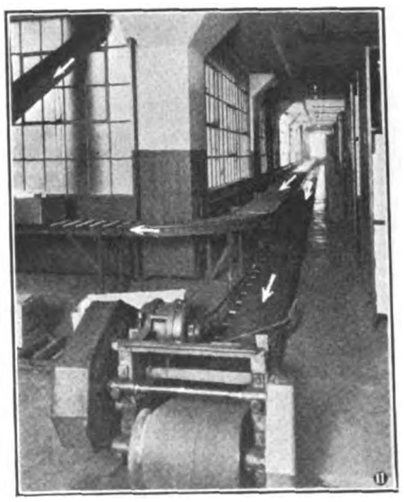


Fig. 11. There are six runs of conveyors similar to the one shown here. These are used by the order pickers to facilitate the filling of orders.

To lower the boxes from the various storage floors to the shipping floor, two gravity roller spiral chutes are used and the discharge from these chutes all converge at one point where the orders are finally assembled, checked and dispatched to the packers. The man at this point who does the checking and assembling also controls the feed to the various packing line conveyors, shown in Fig. 2. The method of converging these conveyors is shown in Fig. 5 and illustrated in Fig. 7. The spiral chutes, which consist of express and local runs, are shown in Fig. 12.

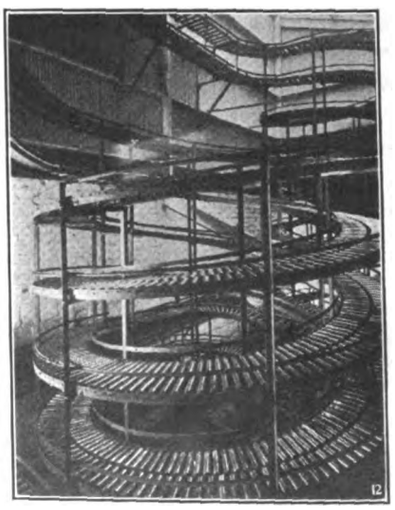
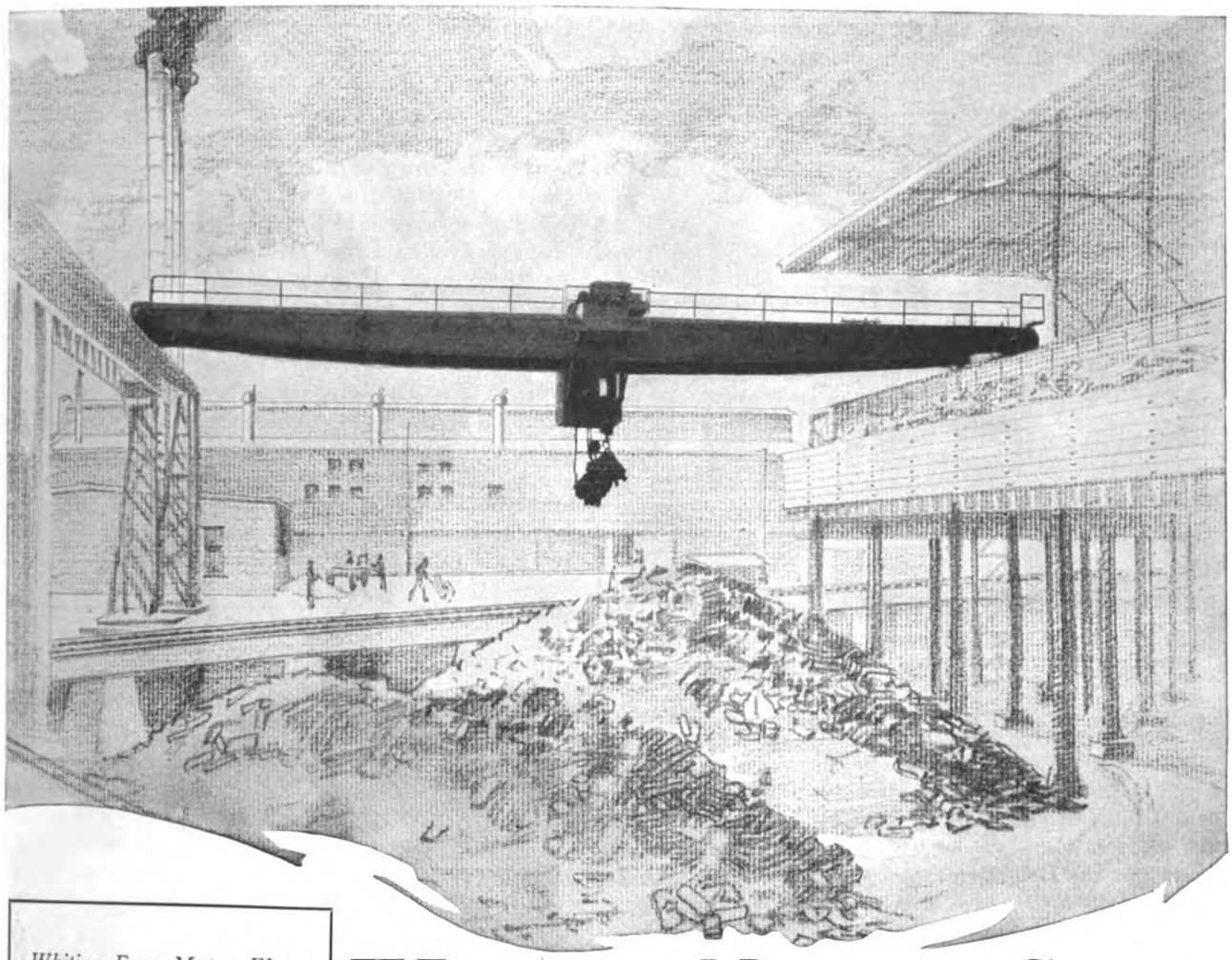


Fig. 12. Two double blade gravity roller spiral chutes are used for lowering the cases from storage floors to packing conveyors on the first floor.

For shipments to the customers, all goods are packed

(*Continued on page* 98)

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(*Continued from page 96*)

in cardboard cartons, and the packing is done on eight different runs of gravity conveyors as shown in Fig. 2. The packing operation is illustrated in Fig. 6. After the shoes have been transferred to cartons from the wooden

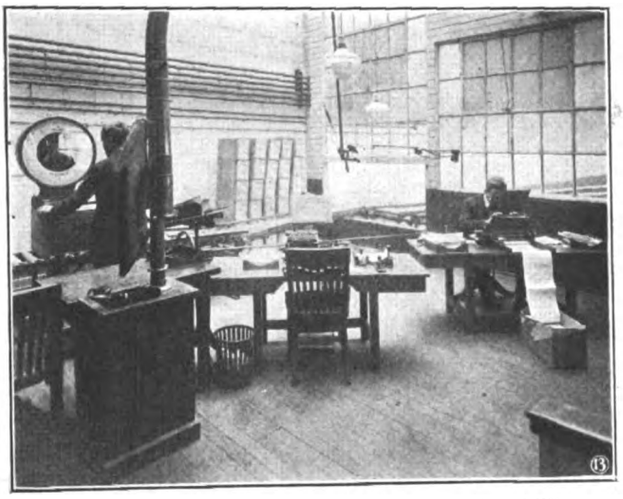


Fig. 13. Notice the neat arrangement of scales, billing machines, adding machines and pneumatic tube system in this shipping office.

boxes in which they were placed on the storage floors, the packers put these empty boxes to one side and they are again collected and re-distributed to the various storage floors for further use. To accomplish this distribution the wooden boxes are loaded on platform hand trucks, pushed on the freight elevators and raised to the various floors. This operation is shown in Fig. 9.

The orders after being packed in cardboard cartons proceed over the gravity conveyors and fall on the belt conveyor as shown in Fig. 6. This conveyor carries them and elevates them through the system as shown in Fig. 2. In the run of gravity conveyor they pass over

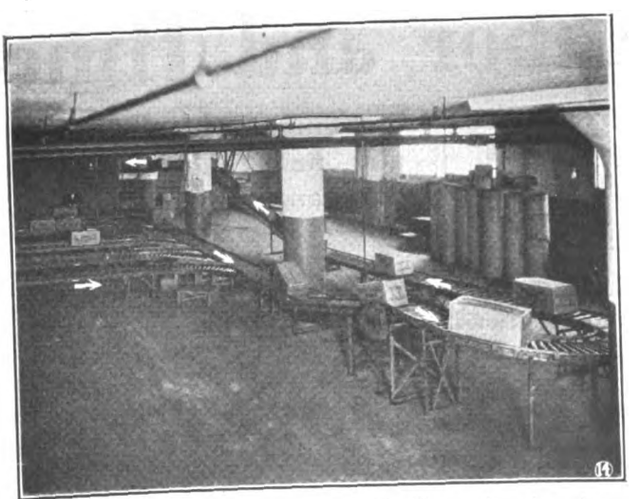


Fig. 14. It will be noted from this illustration that the boxes travel on the horizontal as well as on the incline by employing a combination of belt and gravity conveyors.

a scale, where they are weighed. At this point bills of lading are made out and dispatched by overhead carrier system to the router and checker shown in Fig. 1. The scale, bill of lading clerk, etc., are shown in Fig. 13. It will also be noted that a pneumatic tube system is installed at this point, this is used for conveying the necessary papers back to the general office and vice versa.

After passing over the scale, packages are carried by conveyors to any one of the three stapling machines, where they are sealed shut. The scale man, by means of a flexible section, is able to divert the packages to any one of these three machines. After stapling, the packages are again transported by any one of the six conveyors shown in Fig. 2, to the shipping router and checker illustrated in Fig. 1. The man marked "A" is standing at levers which control the diverters to the various conveyors. From this point the packages can be fed to any one of seven gravity conveyor lines which feed direct to the express delivery point, or they can be diverted to the chute for delivery to the conveyors in the basement for truck shipping. The seven gravity runs of conveyors for express were installed so that each lot of packages could be assembled and held for particular companies without re-handling.

The nine runs of conveyors shown dotted (Fig. 2) are located in the basement and these provide ample room for the assembling of orders to be shipped by truck route. This assembling is all done by the router on the

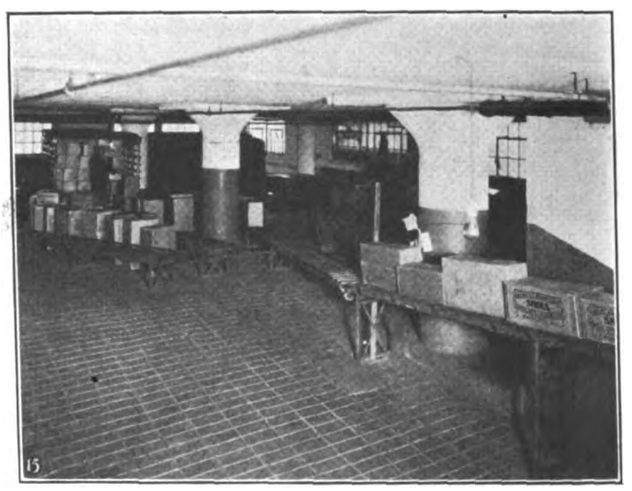


Fig. 15. This shows the method of loading motor trucks direct from the end of gravity conveyors, thus speeding up deliveries.

first floor, as shown in Fig. 1, and by means of a set of levers he is able to divert the packages to any one of these nine runs. The electric control lights, shown in Fig. 2, are connected with contacts in the various runs of conveyors in the basement so that the router can know at all times if the system is working correctly and the lines are clear.

The discharge point of the nine runs of conveyors in the basement as well as the belt conveyors, etc., for transporting the packages to the trucking platform are clearly illustrated in Fig. 14. Here the goods are finally checked before being delivered to the truck company.

As a considerable portion of the packages are now shipped via truck, these conveyors are quite active and, at times, in the busy season, they are taxed to capacity. Arrangements are made on the truck shipping platform so that four trucks can be loaded at one time and the conveyors used for this purpose are clearly shown in Fig. 15. When shipping by truck, the loading is done direct to trailers which are hauled by motor truck tractors. This method of hauling permits loads to be assembled while other loads are being delivered, thus eliminating delays throughout the entire system, and at the same time greatly facilitating delivery to the customers.

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To Help the Executive Cut Power Costs



Close-up view showing Hunt Low-Type, Duplex Self-Locking Cut-Off Gate and Hunt Swiveling Chute—adaptable to any position for loading railroad cars or wagons. Installed in the Gas Plant of the Philadelphia Suburban Co., Chester, Pa.

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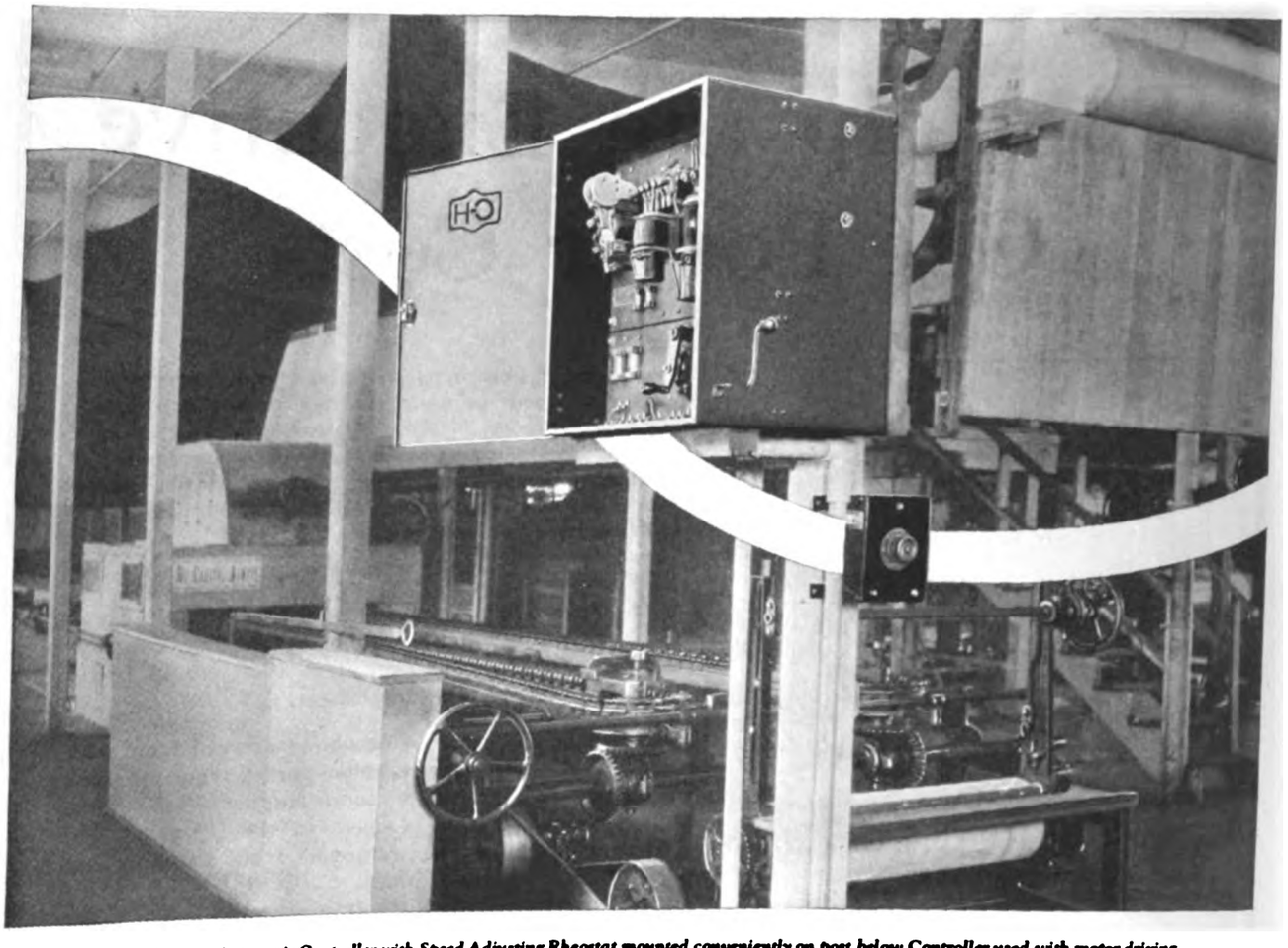
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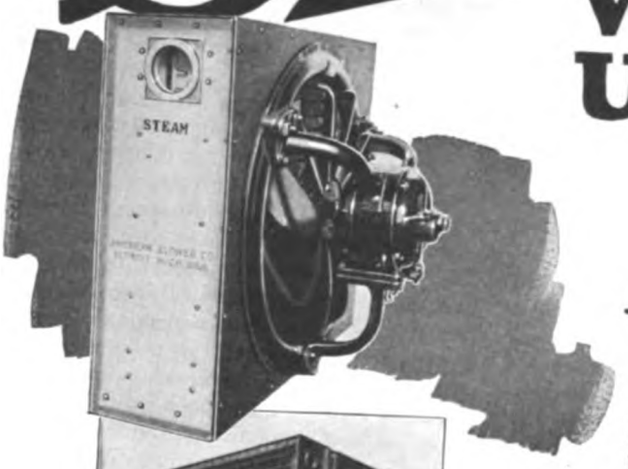
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121 Railroad Street **Geneva, Ohio.**

Do Your Fuses Really Protect?

(*Continued from page 24*)

had been fixed so that they would carry more load than the line itself, and an overloaded circuit beyond question would have produced a fire, and beyond a reasonable doubt a panic.

The extent to which fuses are tampered with, in both household and commercial installations, is amazing. The trouble to which janitors and engineers will go to short-circuit a line through a fuse, simply to avoid the trouble of replacing it, is surprising.

In a Detroit hotel, recently, we found twenty-two brass fuses that had been bypassed by cutting away part of the base and turning it over, thus short-circuiting the fuse. In another part of the same installation we found three pieces of No. 8 copper wire that had been used to replace blown fuses.

Here is not only a fire hazard but a life hazard that at present we can avoid only by finding and correcting such conditions. It is not to be expected that people can be fully educated to the dangers of this practice nor can it be expected that ordinances can be universally passed which will prevent tampering with fuses because of the penalty involved. There is only one answer—to seal effectively the main fuses in every electrical installation.

It is very difficult to say just what percentage of fires are caused by such tampering with fuses. The reason is obvious—the fire destroys the evidence. From the number of such cases that we find, however, and from the danger of fire that such a condition produces, we are certain that a great deal of property damage is resulting every day from this cause.

Fires that start from electrical defects are mainly attributable to two conditions—either the looping or kinking of wire, or the doctoring of fuses.

Fuses are placed in a circuit for a very good reason—to guard against overloading of the conductors, and against short-circuits. When fuses of the proper size continually blow out, it is not the fuse that is wrong. When this happens an investigation by a competent electrician should be made.

To permit the user to replace these blown fuses with copper bars, wire, nails or pennies is to permit the creation of a serious life and fire hazard. There is no question about the danger of this practice. Every day inspectors from this department and from the fire marshal's office turn up such installations, and I would not venture to guess how many serious fires we have averted by such discoveries.

What can be done about it?

Is it necessary to stand by and let such an evil go on?

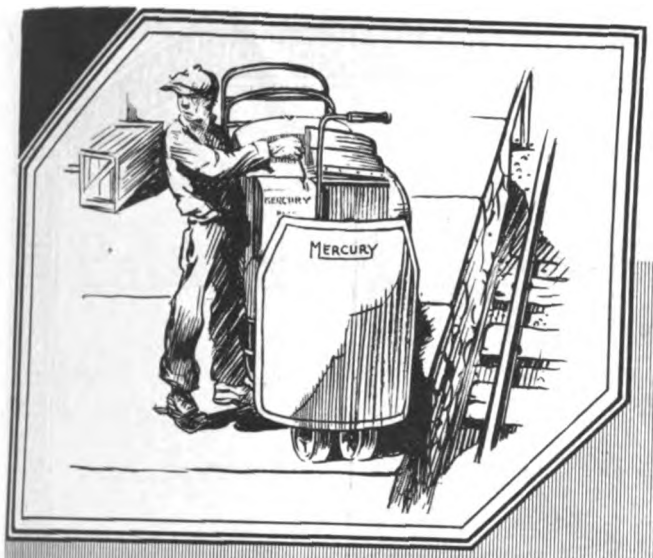
Do we have to go along, cheerfully replacing doctored fuses as we find them, and trusting to providence that those we do not find will cause no trouble?

There is but one solution to the problem—*put the main fuses under seal.*

We would not think of permitting a user of electricity to wire his building with bare wire. We certainly would object to his using No. 18 or No. 20 wire in his main and branch circuits. Why, then, let him create almost the same hazard by making it so easy to doctor the main fuses?

The plain answer, and the only way out, is to put the main fuses where the user cannot reach them, for if he can he will doctor them as soon as they blow out.

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Safety First

—and the Mercury "TYPE H"



Did this ever happen to you?

Has some foolishly curious and irresponsible person ever tampered with the controller of one of your tractors—in the absence of the authorized driver—and thereby caused the machine to run amuck—and destroy property—damage the machine—endanger human life—and worse?

Accidents of this nature *never* occur with the Mercury "Type H."

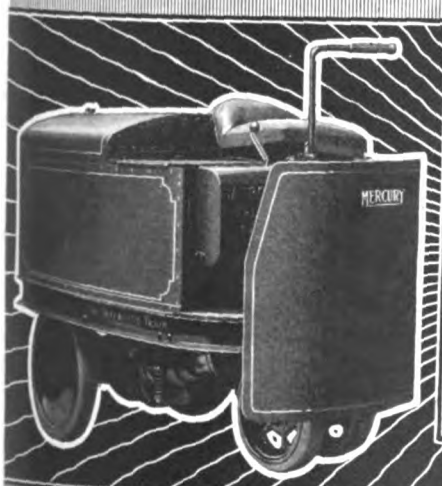
because—

The moment the driver leaves the seat the *safety features* automatically function. The controller is "shot back" to neutral—the brakes are set—and the circuit between the battery and motor is broken.

This safety device will—without thought or action on the part of the driver—bring the tractor to a standstill *within three feet* when traveling at *full speed.*

And it remains safely "dead"—no amount of tampering with the controller will cause it to move—until the driver is again in position with one hand on the controller—the other on the steering lever—and his foot in position on the brake—the machine then moves off under full control and with perfect safety.

The automatic safety devices are only one of nine outstanding features of the "Type H" tractor—the rest are told in Bulletin 106—write for a copy today.

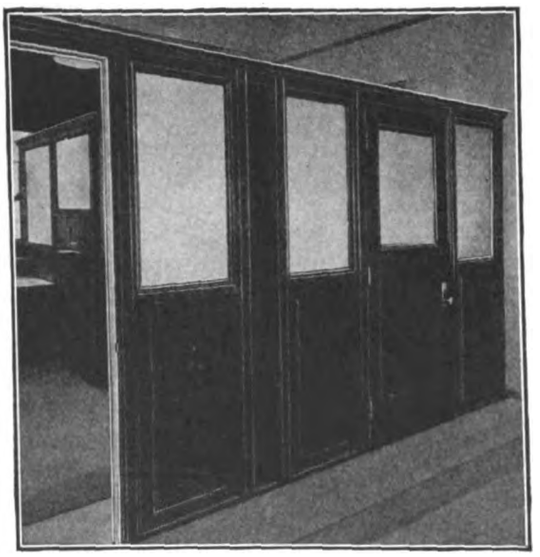


Mercury Manufacturing Company

4112 South Halsted St.

Chicago

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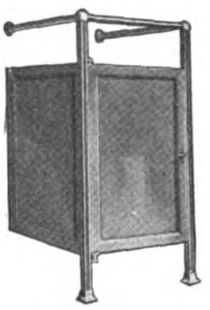


Sanymetal
Office Partitions,
Damascus Mfg. Co.
Cleveland

1800 Installations Last Year

DURING the year 1924 over 1800 installations of Sanymetal Toilet and Office Partitions were made. This nation-wide acceptance on the part of building owners, architects, and engineers is conclusive proof of the tremendous popularity of these products.

Sanymetal Office Partitions, illustrated above, are made in sectional units, to fit any requirements, for industrial or general office use. Perfectly fitted and trimmed, finished in baked enamel. Their *Interlocking* construction means actual rigidity. Their fire retardance cuts insurance rates. And their *first and only* cost is no more than that of an equivalent wood installation.



Sanymetal Products are: Partitions for toilets, showers, dressing rooms, urinals. Partitions for offices and factories. Metal doors, screens and wainscot. Sanymetal Gravity Roller Hinges for toilet doors. Write for latest Bulletins.

The Sanymetal Products Co., 1709 Urbana Rd., Cleveland, O.

Sanymetal

TRADE MARK U.S. REG.

Toilet and Office Partitions

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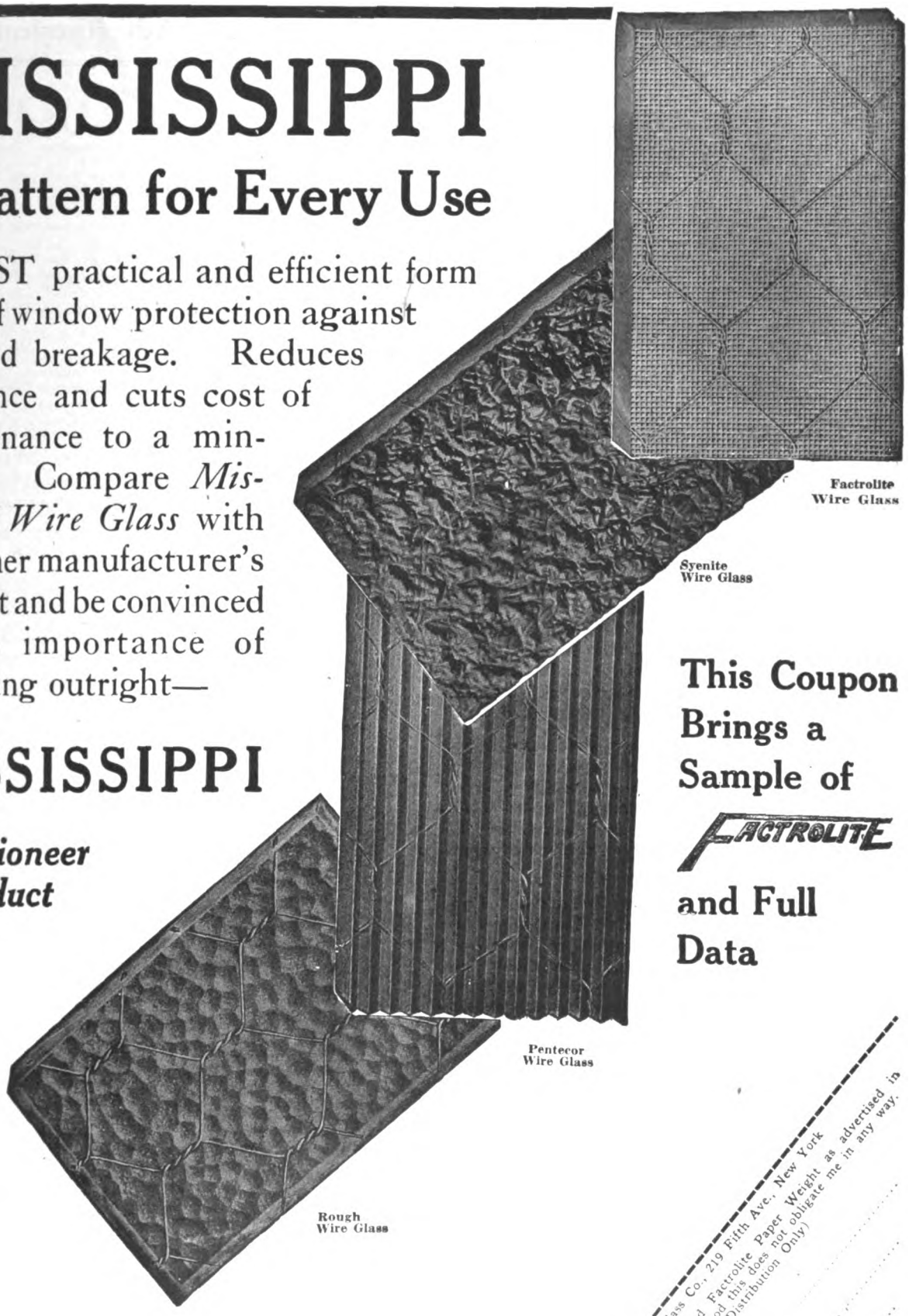
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MOST practical and efficient form of window protection against fire and breakage. Reduces insurance and cuts cost of maintenance to a minimum. Compare *Mississippi Wire Glass* with any other manufacturer's product and be convinced of the importance of specifying outright—

MISSISSIPPI

The Pioneer Product



This Coupon Brings a Sample of FACTROLITE and Full Data

Gentlemen: Send me a Catalog and Factrolite Paper Weight as advertised in Industry Illustrated. It is understood this does not obligate me in any way.
(For American Distribution Only)

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Address .....

Mississippi Wire Glass Company

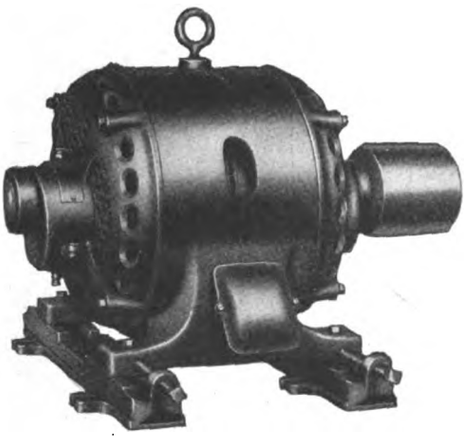
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"They Keep a-Running"



Low Starting Current Advantages

Because the starting current of all sizes of Century Automatic-start Induction Polyphase Motors does not exceed 245% of full load current, any approved single throw switch may be used for starting. Skilled attendants, special manual controls, compensators, or other current-limiting devices are unnecessary—features which make this type of motor particularly desirable for automatic and remote control.

Another advantage in low starting current lies in the fact that the regular operating fuses are in most cases large enough to effect a start. In the few isolated cases where slightly heavier fuses are necessary, they are always small enough to give the motor ample overload protection.

Century Automatic-start Induction Polyphase Motors are especially desirable wherever a motor is called upon to develop a heavy starting torque with a definitely limited current. They are widely used for operating refrigerating machines, plunger pumps, compressors, conveyors, extractors, crushers, mixers, high-speed machinery and similar apparatus.

Built in all standard sizes from ½ to 60 h.p. —temperature rise not more than 40° Centigrade.

Send for Bulletin No. 28

Bulletin No. 28 outlines clearly the reason for Century Automatic-start Induction Polyphase Motor superiorities. Send for your copy.

CENTURY ELECTRIC COMPANY
1827 Pine Street St. Louis, Mo.

Sales Offices and Stocks in Principal Cities

½ to 60 h.p. Century MOTORS ½ to 60 h.p.

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Do you figure out your own gas problems?

—or hesitate to use gas because you can't?

AFTER twenty years of comprehensive experience in every phase of gas production and utilization, the Smith Gas Engineering Company offers a consulting service that will save money for actual and potential users and producers of gas—city gas, natural gas, or producer gas.

It is an unbiased, unprejudiced service, wholly detached from the sale of any equipment. It has to be so in order to serve the best interests of the clients who take advantage of it. Therefore a charge is made for it—a slight charge in comparison with the economies that can be derived.

The Smith Gas Engineering Company's range of experience is suggested by the typical problems listed opposite. Each presents its different, individual phase of gas production or application, and the data and experience accumulated in solving these problems is at your disposal.

Write for complete details of this plan for serving you.

Work has been done for these well-known concerns during the last three years:

Aluminum Company of America
Indian Refining Company
Kellogg Company
International Harvester Company
Standard Sanitary Manufacturing Company
Ford Motor Company
National Biscuit Company
Mutual Potteries Company
Shanghai Mint, Shanghai, China
Ganga Glass Company, Delhi, India
Vacuum Oil Company, Alexandria, Egypt

Smith Gas Engineering Co.
Dayton, Ohio

The Smith Gas Engineering Co. (Manufacturing Division)

manufactures the following equipment

Smith Gas Producers for bituminous coal, lignite, coke, charcoal, semi-anthracite and anthracite
Tar extractors for coke oven and producer gas
Smith Recording Gas Calorimeters
Smith Gas Valves
Recuperators for furnaces and ovens
Special gas furnaces
Bunkers, bins and storage tanks of every kind
Scrubbers, condensers, and coolers for by-product and coke oven plants
Trench digging machines for public service pipe lines
Garbage disposal and rendering plants for municipalities, packing houses and the like

Your problem *is solved here—*

Twenty years of turning gas waste into profit is summed up in this list of achievements.

The application of gas to furnaces and ovens of many kinds in many industries.

The design of the most efficient and modern fuel plants for the food baking industry.

The designing and building of special furnaces for special purposes.

The designing of metal recuperators for coke ovens which have greatly lessened the cost of construction.

The developing of the most efficient method of cleaning coke oven and producer gas.

The developing of instruments for recording the heating value of gases.

The designing and constructing of clean producer gas plants in which gas is made from bituminous coal, anthracite, coke, charcoal, and lignite, distributed like city gas for use in metallurgical furnaces, ovens, kilns and engines.

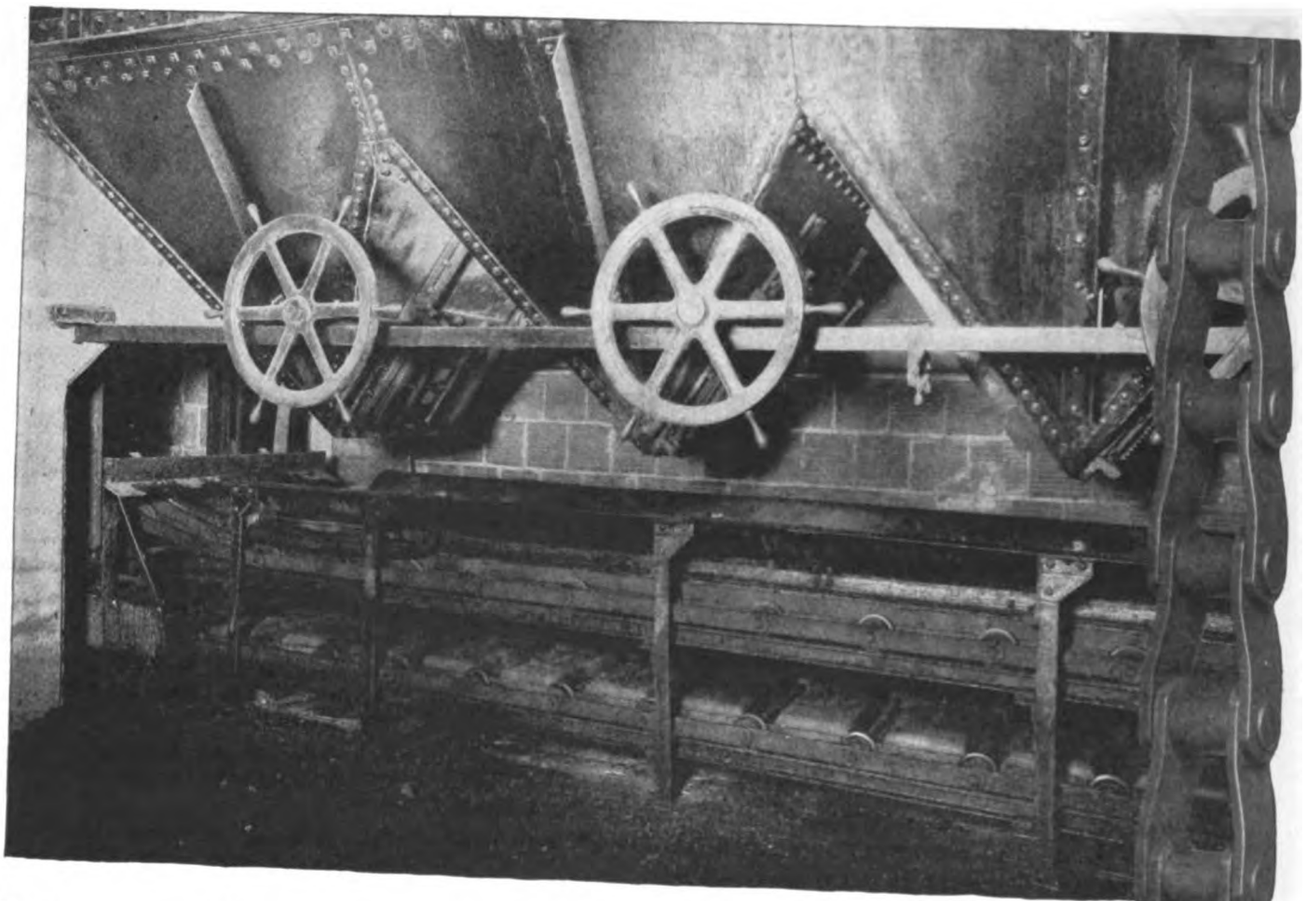
The converting of hot producer gas plants to clean cold producer gas plants and extending the utility of producer gas to many refined heating operations where accurate control of processes is necessary.

The creation of methods of utilizing cheap gas of low heating value as efficiently as gas of high heating value.

The developing of apparatus for the efficient production of fuel gas from low grade lignite, wood refuse, sawdust, shavings, etc.

The developing for the Delco-Light Company of a thoroughly practical and highly efficient gas producer of very small size for operating farm lighting units in those countries where liquid fuels are very expensive.

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Handling the Day's Ashes in 2 Working Hours

This Rex Cast Iron Pan Economy Conveyor, installed in July, 1922, in the Plant of the Indiana-Michigan Electric Company at South Bend, Indiana, under two 1,000 H. P. Sterling Boilers, has run without operating delay at 200% rating since that time. To handle 15 tons of ashes per day, it is operated by two general plant men twice daily, for only an hour at a time.

The economy and practicability of this sturdy, unfailing type is detailed in the current number of "The Conveyor." It will be sent upon receipt of the coupon at right. No obligation. We are glad to acquaint you with the scope of Rex Economy Conveyors and our experience in the Material Handling Field, including Pivoted Bucket Carriers, Beaded Flight Conveyors, Continuous Bucket Elevators, Belt Conveyors, "V" Bucket Elevator Conveyors, Screw Conveyors, Drag Chain Conveyors, Scraper Conveyors, and Ash Handling Equipment.

REX ECONOMY CONVEYORS

CHAIN BELT COMPANY
Milwaukee, Wisconsin

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Milwaukee, Wisconsin
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Hyatt equipped lift truck manufactured by The Cowan Truck Company, Holyoke, Mass., in operation at The Northwestern Malleable Iron Co., Milwaukee, Wis.



Reduce Your Handling Costs With Hyatt Equipped Lift Trucks

LIFT truck systems have proved themselves savers of time, labor and space. When the trucks are equipped with Hyatt roller bearings they are a thoroughly modern means of handling material economically and dependably.

The Cowan Truck Company has for years equipped its standard lift trucks with these bearings to the complete satisfaction of its customers.

Hyatt bearings in truck wheels permit easy running with the least effort, speeding the movement of material and conserving man power.

The freely turning action of the steel rollers eliminates plain bearing friction and prevents wear, thus insuring long life for the truck. Their distinctive construction provides positive lubrication at all times with infrequent application of oil.

The advantages of Hyatt bearings are well worth having. Always specify them when buying trucks of any type.

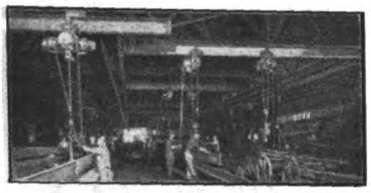
HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
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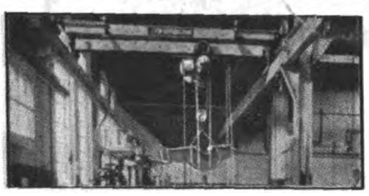
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Our mission is to serve Industry with this Equipment



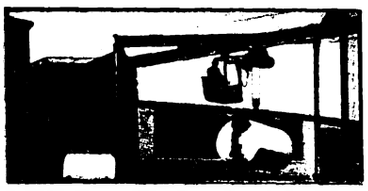
The LiftAbout and LiftAbout Jr.

These are floor operated electric hoists in capacities of ½ and 1 ton, and 500 pounds, respectively. They have made a reality the description "an electric hoist for everybody." In thousands of widely varying lines of business they are profitably used, and pay for themselves quickly in the time and labor saved in lifting and moving materials. Send for the "Book of Illustrated Economies", an illustrated description of fifty actual installations.



Floor Operated Hoists to 10 tons

The Shepard line of Floor Operated Hoists is so complete that a type can be supplied to meet every condition and capacity. In a descriptive catalog and price list, recently published, these hoists are completely described and illustrated. It is the most comprehensive book of its kind and provides the prospective user of electric hoists with all the necessary data, dimensions, and prices of Shepard Hoists. Write for a copy.



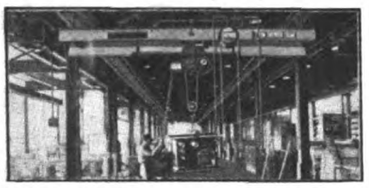
Cage Operated Hoists to 10 tons

One man, the operator, can handle tonnage loads with ease and precision. This type of hoist, operating on monorail track, a Shepard Transfer Crane, suitable spur tracks, and switches, comprises the Shepard "Aerial Railway of Industry." This system affords quick inter-department load-handling — a "through without change" method. We have issued a bulletin, replete with data and illustrations of this Aerial Railway. Write for a copy.



Electric Traveling Cranes to 30 tons

The company that buys a Shepard Crane not merely purchases a crane, but invests in a very definite crane service. The assured performance of this equipment is a profitable aid to production in many plants. Our crane bulletin describes and illustrates the Balanced Drive, enclosed unit construction, oil bath lubrication, permanent alignment and other advantageous features. Send for a copy.



Single I-Beam Cranes to 5 tons

These light capacity cranes are ideal for serving side bays, balconies and places where limited headroom precludes the use of a large electric traveling crane. They are equipped with Shepard Hoists with plain, geared or motor driven trolleys. The bulletin which describes these handy cranes, explains how every square foot of a floor or bay is made accessible to the hoist hook. Write for a copy.



Electric Cupola Charging Hoists

Better metal through proper distribution of charges. This hoist specially designed for charging cupolas may be equipped with a bottom dump bucket or magnet to suit individual requirements. Operating on suitably laid out track and equipped with an electric bucket, it also will handle sand and fuel; with a magnet it handles scrap and pig iron; and without any attachment it does miscellaneous lifting in and about the foundry. Write for foundry bulletin.



Winches, Speed Reducers, etc.

Industrial Winches, Crane and Derrick Hoists, Elevator Hoists, Speed Reducers, and Back Geared Motors are furnished in a wide variety of types to meet every requirement. The principles of design are similiar to those which have made Shepard Hoists so successful. A new descriptive catalog and price list is now being prepared. We shall be pleased to reserve a copy for you, and send you, now, any specific data you desire.

SHEPARD ELECTRIC CRANE & HOIST CO., 420 Schuyler Ave., Montour Falls, N. Y., U. S. A.

Branches in principal cities

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SHEPARD

ELECTRIC CRANES & HOISTS

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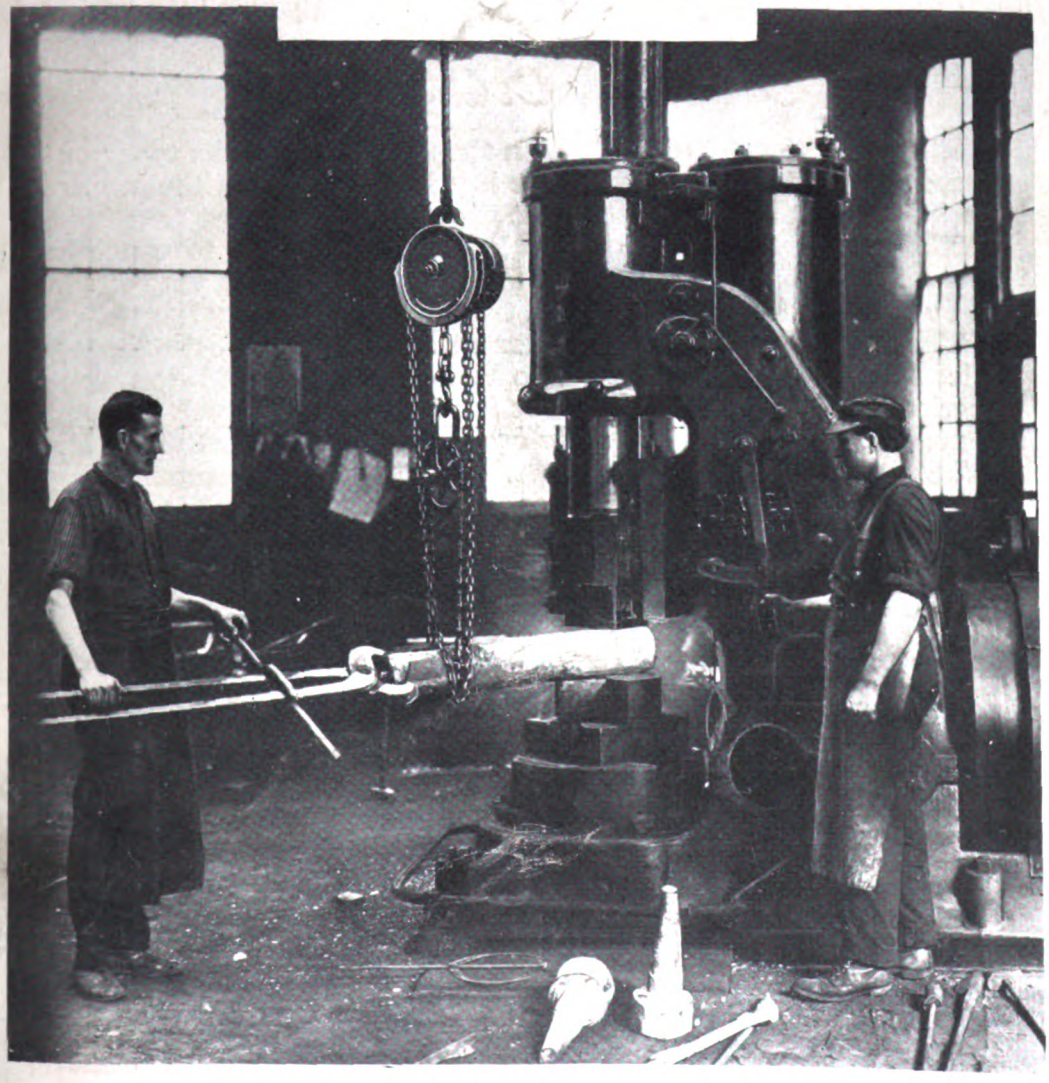
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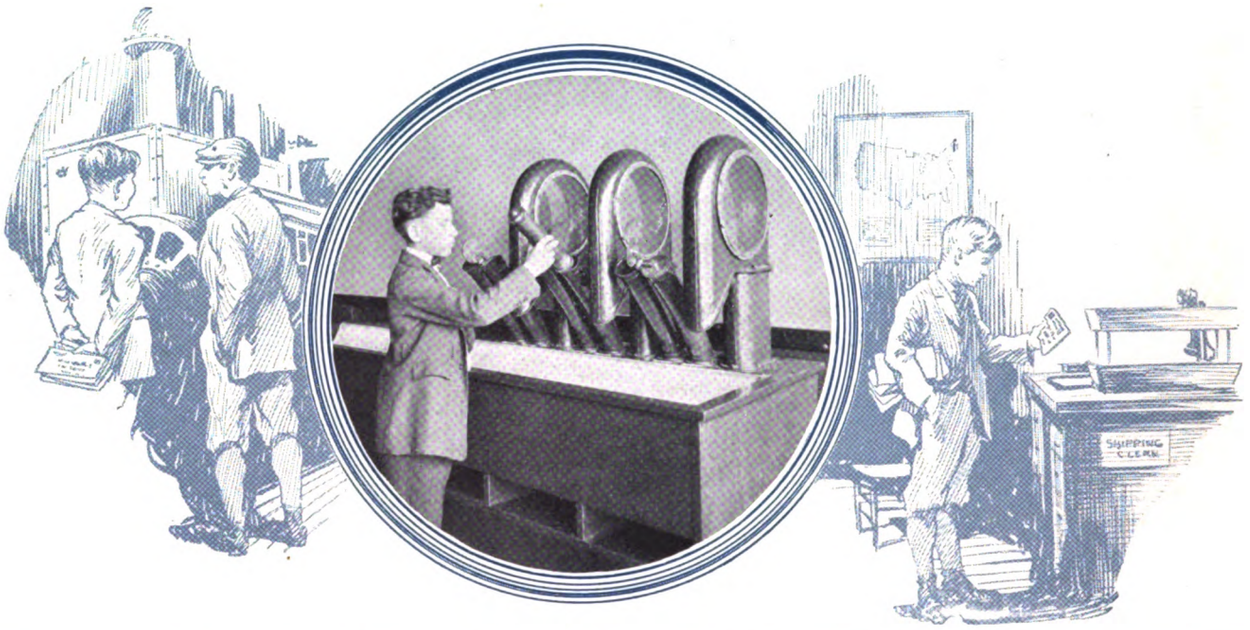
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MARCH - 1925



PUBLISHED by THE ENGINEERING MAGAZINE COMPANY 120 W. 32nd Street NEW YORK

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Carrying the Industrial Message to Garcia, Inc.

That industrious young man on the right may be the type you can depend on to deliver what he has in his hands to the proper desks—as quickly as he can make the rounds.

The future presidents on the left paused awhile to watch a few wheels of industry revolve. They may not do that very often, but what if the letters, or orders, they carry are urgent?

The young fellow in the center works for the Westinghouse Electric Company, in its Chicago Warehouse. He is inserting a carrier which may contain letters for the 6th floor; rush instructions for the shipping clerk; or orders to be filled by 2:30 P. M. Whatever the carrier contains will be delivered without error and without delay. The proper department will get it almost instantly.

By adopting a Standard Pneumatic Tube System, the Westinghouse Electric Co. speeded up the day's work.

It is essential these days that industry speed the day's work where possible; and that it eliminate time, waste and error.

For you who have an interest in accelerating the work we have made a collection of photographs that you might like to have. We will also be pleased to give you any information on Pneumatic Tube Systems of interest to you.

Write for Photos—Group S-3

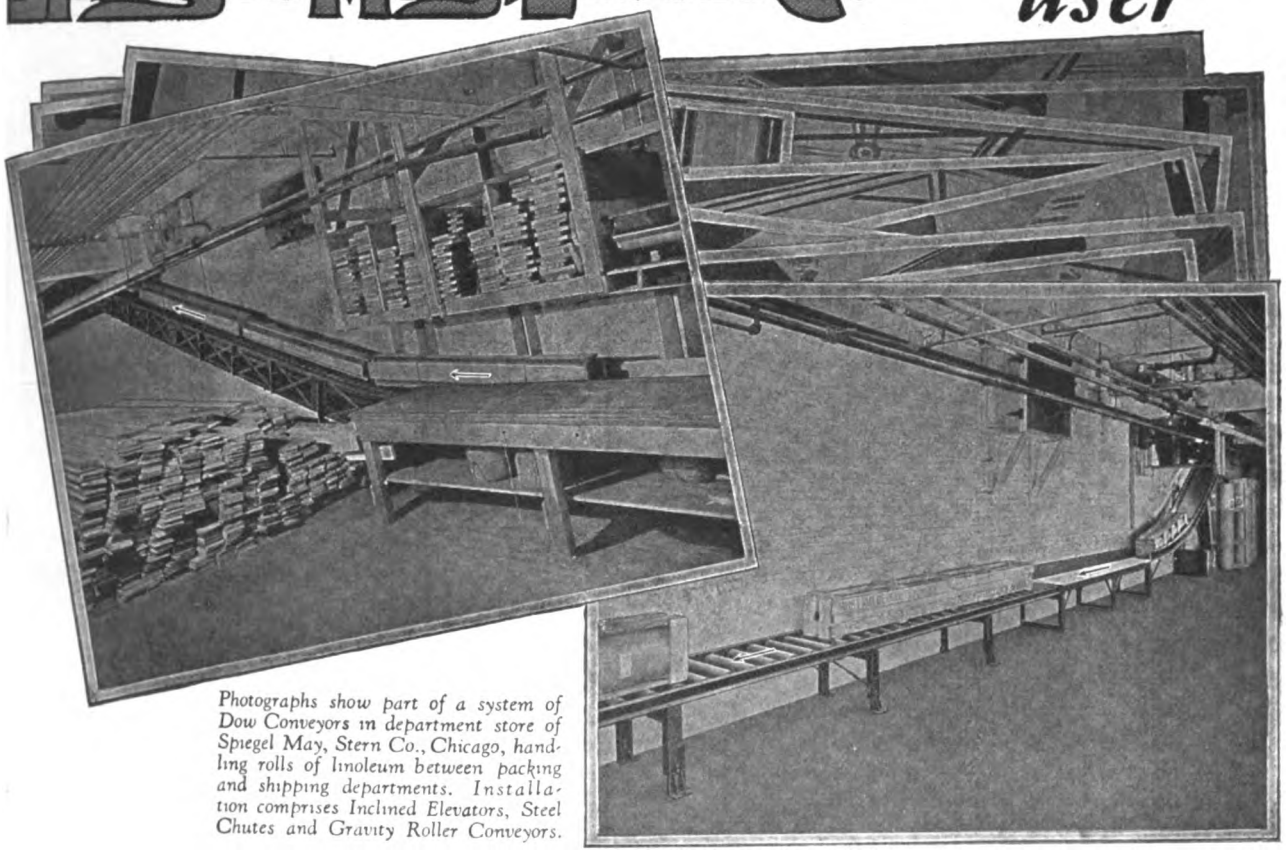
STANDARD
CONVEYOR COMPANY

NORTH SAINT PAUL, MINNESOTA

Branches in Every Principal City

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Spiegel May, Stern Co.—another user



Photographs show part of a system of Dow Conveyors in department store of Spiegel May, Stern Co., Chicago, handling rolls of linoleum between packing and shipping departments. Installation comprises Inclined Elevators, Steel Chutes and Gravity Roller Conveyors.



"SEND IT, PLEASE." The freedom and frequency with which Spiegel May, Stern Co., Chicago department store, is asked to deliver purchases to points near and far require handling methods that work fast and economically. For upon this condition depend the two most potent factors in successful merchandising—turnover and price. Dow Conveyors were the logical choice. Thus one more chapter is added to a romance of business development in which Dow Conveyers have demonstrated their ability to reduce costs and increase profits in practically every conceivable business. How about yours?

THE DOW CO. LOUISVILLE, KY.

New York Office, 50 Church St.
Detroit Office, 8855 Woodward Ave.
Indianapolis Office, 425 Board of Trade Bldg.
Los Angeles Office, 502 Grosse Bldg.
Chicago Office, 343 S. Dearborn St.
Kansas City Office, North Kansas City
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Representatives in other principal cities

DOW LOUISVILLE **CONVEYORS**

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One Way to Make Money

omit unnecessary operations

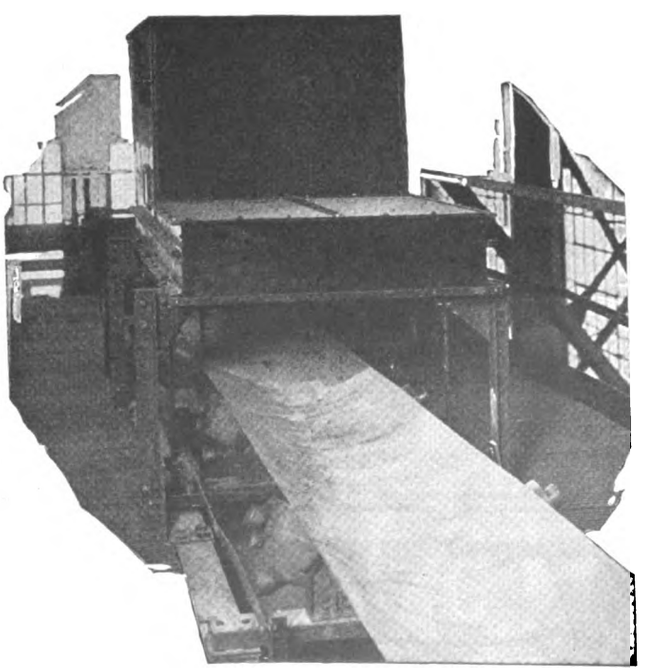
If you can accomplish an objective in one motion instead of two you have halved your production costs so far as that particular operation is concerned. And everybody knows the urgent necessity for reducing costs these days.

If your *moving and weighing* are done as two operations you need the Merrick Weightometer. It will enable you to do both operations at the same time—to weigh materials as they move. Just attach the Weightometer to your conveyors, start the materials moving, and at the end of the job, the shift, or the day you have an accurate record of the total weights of the materials handled. And this weight is guaranteed to be 99% correct.

The latest "Merrick Catalog" is just off the press. Write for it. It will be mighty interesting.

Merrick Scale Mfg. Co.

180 Autumn St. Passaic, N. J.



The Publisher's Column

Elsewhere in these pages appears a graphic presentation of some interesting facts concerning the purchase or generation of power for industrial use. These facts are summarized from a survey recently made by INDUSTRY ILLUSTRATED of 142 representative American manufacturing plants. It is quite obvious that, while central station service is used either wholly or in part in many plants, it cannot displace the private power plant where heat is a large factor; because in such cases power is practically a by-product.

The more deeply we delve into this subject of industrial power costs, the more we are impressed with the fact that the industrial executive has not, in the past, given it the attention its importance warrants.

Last month, we presented an article by Mr. J. P. Jordan on How to Know Your Power Costs. For our April number, in addition to further graphicalized facts from our power survey, we have arranged for the first article of a series which will appear each month thereafter. This series is especially planned to acquaint the executive—in too many cases a "layman," as regards power—with what he needs to know about industrial power generation.

This series of articles will carry the busy executive out to the mine, to see how coal is prepared and what determines its value; to the plant coal handling facilities; to the stokers, the boilers, and so on. Figuratively speaking, we are going to take you on a "coal ride," from the mine to your factory chimney; and on a "steam ride," from the boiler on out through your plant.

Planned especially for your needs, we believe that this "personally conducted tour" will result in giving you a new—and profitable—approach to your own power problems.

Industry Illustrated

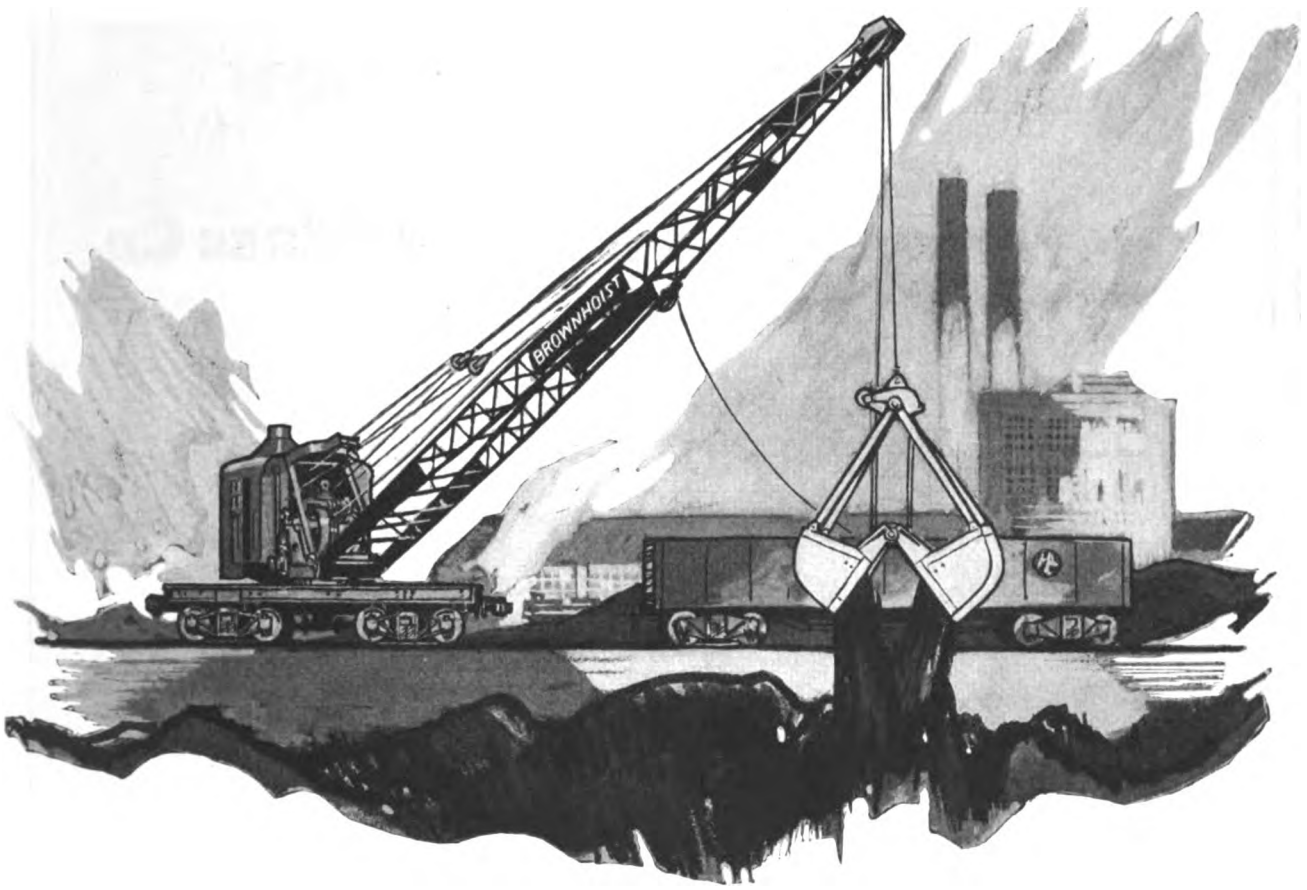
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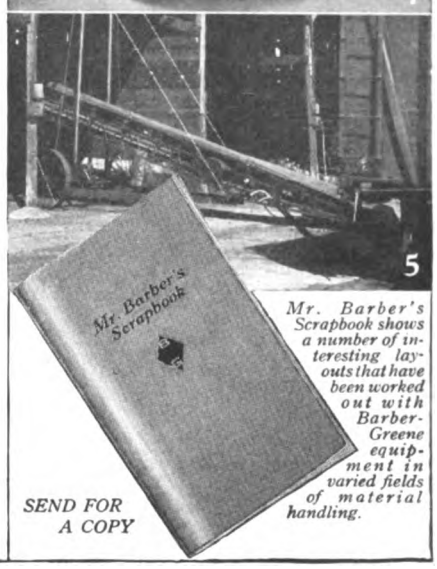




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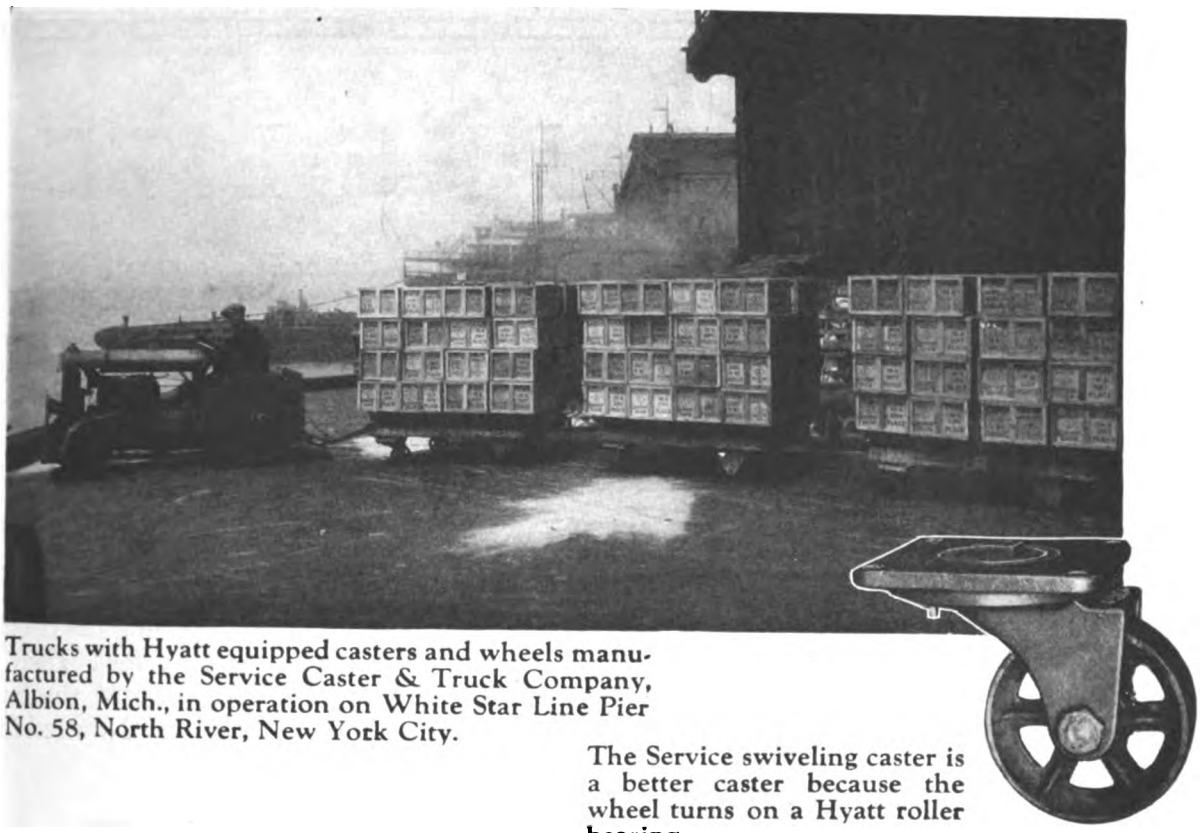
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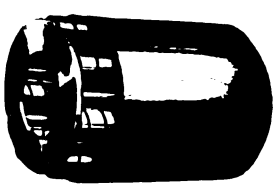
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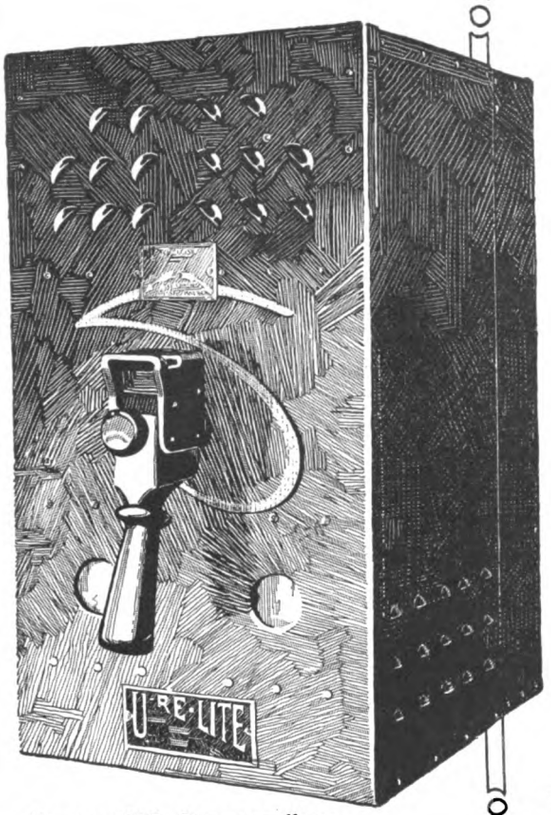
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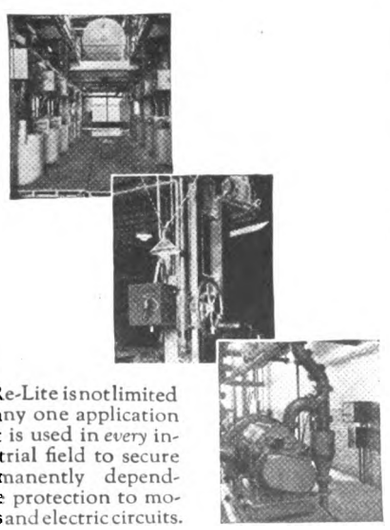
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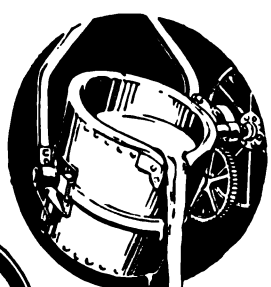
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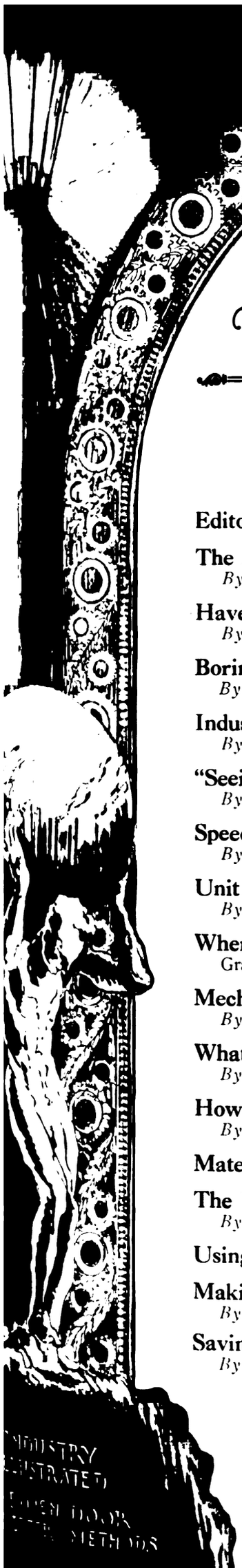
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MARCH, 1925

Industry Illustrated

The Pictorial Presentation of Practical Management

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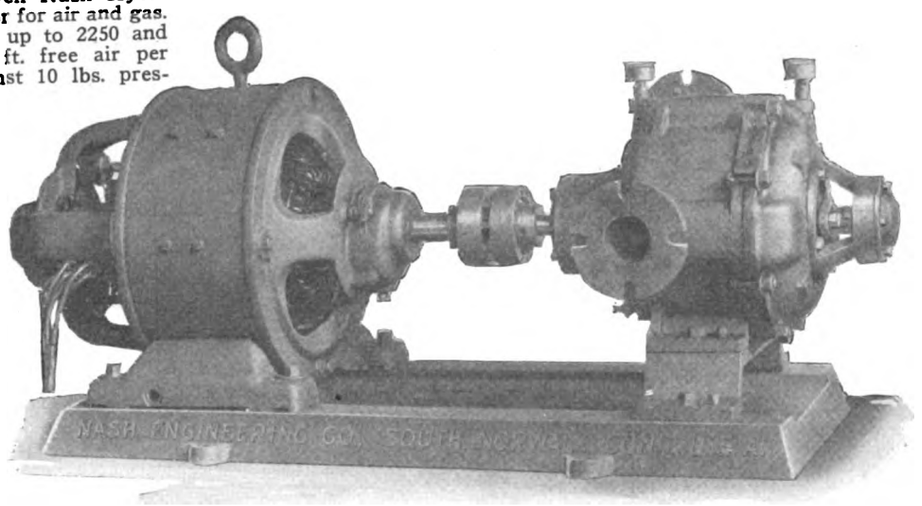
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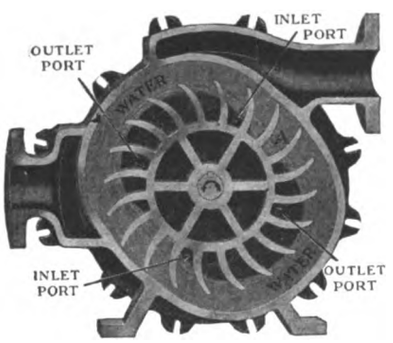
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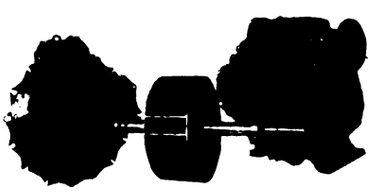
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The Pictorial Presentation of Practical Management

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W. THOMSON LEES, MATTHEW W. POTTS } *Associate Editors*

ADOLF SCHILDKRAUT, *Art Director*

Editorial

The Industrial Bootlegger

BEWARE of that smooth and persuasive individual who is effectively building new business graveyards—the industrial bootlegger. He is a dangerous man. He is calling on your purchasing agent or superintendent today, peddling his illicit goods.

He thrives on the fact that big men often overlook little things. He makes a good living because of the human tendency to be "penny wise and pound foolish."

He thrives on that peculiar bargain-hunting disposition which will lead many a man who should know better to equip an expensive, high-grade machine with a cheap belt or an inferior cutting tool, at a saving in first cost of a few cents and a loss in total cost of a great many dollars.

It is the little things in industry that are overlooked, but the little things are the ones that count.

You pay a man who works for you in accordance with his ability to produce quickly, steadily and excellently.

You buy your more expensive mechanical equipment—your machine tools, boilers, engines and the like, on the same careful basis of tried and tested performance.

Then why listen to the industrial bootlegger when it comes to buying the little things—the small tools and supplies upon which both your men and your larger machines are absolutely dependent for economical and sustained output?

Many a man carefully buys an expensive machine, insists that it be the most up-to-date and efficient obtainable, then unthinkingly kills its earning power because he listens to the siren song of the industrial bootlegger.

It is penny wise and pound foolish to hire good men or buy good machines and provide them with cheap tools and supplies.

Beware of the industrial bootlegger. You can recognize him by his offering something "just as good for a few cents less."

Such so-called bargains are exceedingly expensive buys. You pay for them out of your profits many times over.

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The Application of Fuel Oil to Industrial Use

The Importance of Proper Design of Oil Burner Installations

By C. C. Hermann

OIL as a fuel in industry has enjoyed a remarkable growth. From a mere admission that oil possesses some characteristics of a desirable fuel to almost universal recognition of the advantages of oil fuel by engineers and executives mark the rapidity of its growth in favor. In comparatively recent years engineers of considerable note have predicted that oil burning would not make appreciable progress because of the increasing scarcity of oil, that the oil reserves of the world were on the wane. However, progress in the design of fuel oil equipment does not seem to be in harmony with the prediction in this regard. The demand for oil and gasoline has constantly increased from year to year and yet we note that the oil companies have been able to keep up with the demand—in fact, far enough ahead of the demand as to cause considerable fluctuation in price.

Fuel oil users may be divided into four classes, namely: Marine, Railroads, Industry, and Residences.

The use of oil as fuel on ships seems to have taken root along the Pacific coast first, due primarily to the fact that there is no native coal available, and what coal may be used is shipped westward over the Rockies from the eastern and central States. On the other hand, the Pacific coast was well supplied with oil, there being vast workings near at hand. Comparatively, therefore, oil constituted far the cheaper fuel.

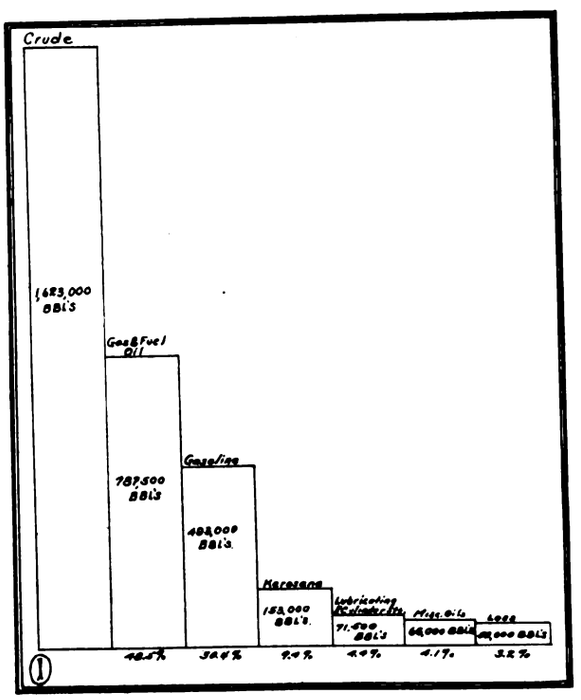


Fig. 1. Above is shown graphically the distribution of the daily production of crude run in the United States.

The railroads, particularly the western ones, are large users of fuel oil. The coal burning locomotive has proved entirely inadequate on the mountain divisions of the large railroads with their sharp curves and steep grades and heavy freight hauls. Such roads have either turned to oil burners or have electrified their roads.

In industry we have two main divisions of application of oil burning: (1) Steam generation for power and heating purposes and, (2) its application to industrial appliances and processes. Industry was slow in changing to oil fuel, primarily due to the fact that industry was chiefly confined to sections of the country where coal as a fuel was plentiful. When

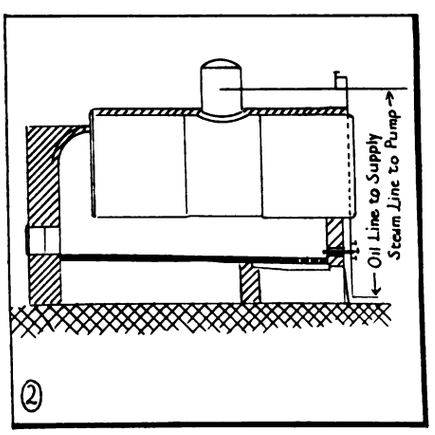


Fig. 2. The return tubular boiler with hand fired setting converted to oil firing and using steam as the atomizing agent.

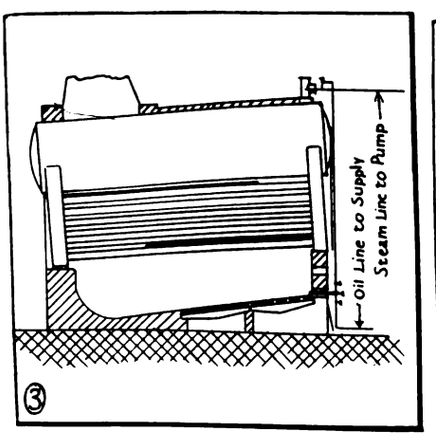


Fig. 3. Showing how the Heine boiler is equipped with oil burning. As in the case of Fig. 2, the bridge wall is modified to give the proper slope to the floor of the setting.

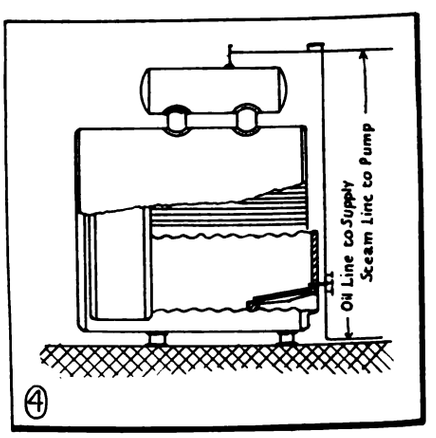


Fig. 4. In the Scotch Marine Boiler a very short grate is substitut d for the ordinary one, in order to provide greater combustion space.

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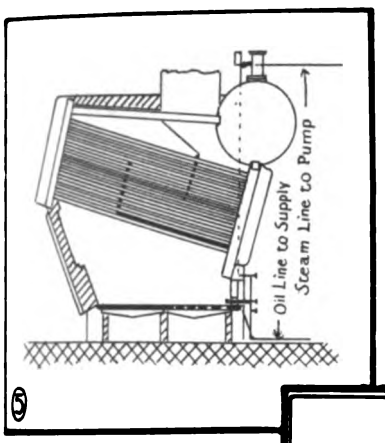
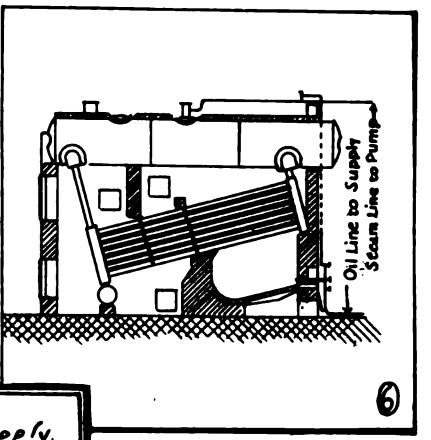
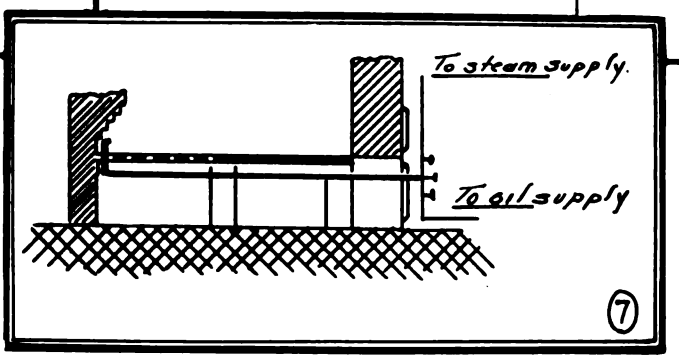


Fig. 5. At the left—On this B. & W. Cross Drum Boiler, marine type, again the floor of the setting is raised and the grate covered over with a checker work of brick.

Fig. 6. At the right—Steam atomizing boiler applied to the conventional water tube boiler. The rear end of the grate next to the bridge wall is filled to give an upward deflection to the gases of combustion.

Fig. 7. Below—A general layout for "black shot" method of oil burning under steam boilers.





seeking a location for an industrial plant the wise manager first made a survey of the fuel possibilities. Power being the chief tool of industry, the assurance that there would be ample power at a reasonable cost constituted a matter of great concern. We find, therefore, the large industrial centers are likewise large fuel centers. The location of vast coal reserves in the Central West preceded the establishment of vast industrial operations in that region. Likewise the discovery of oil on the Pacific coast was a forerunner of huge industrial operations in that section. The transportation of coal over long distances is not inviting to industry and but for the discovery of oil in California those inhabitants would today be purchasing in eastern markets many commodities that are now made at home.

Early in the transition period from coal to oil in the power plant, it was discovered that merely sticking an oil burner in the front of the setting and bricking over the grate in checkerwork fashion does not constitute an efficient installation. However, it was necessary for this method to suffice, and the engineer directed his energies towards obtaining the most efficient installation possible under the circumstances. Only in comparative recent years were boiler plants designed and built for the exclusive use of oil for fuel and it is in these plants that we can look for the highest efficiency in operation. Even today there are numerous installations of oil burners contemplated that will constitute merely a changing over from coal to oil. With the available experience, however, these may be turned into comparatively efficient installations.

The conversion in the hands of inexperienced persons has done more to retard the use of liquid fuel than any other agent. Through this misplacement of the task higher efficiencies have suffered, fuel costs in many establishments are higher than they should be and the economy of the power plant taken as a whole is lower than it should be.

Through the attempt to make the furnace readily convertible from oil

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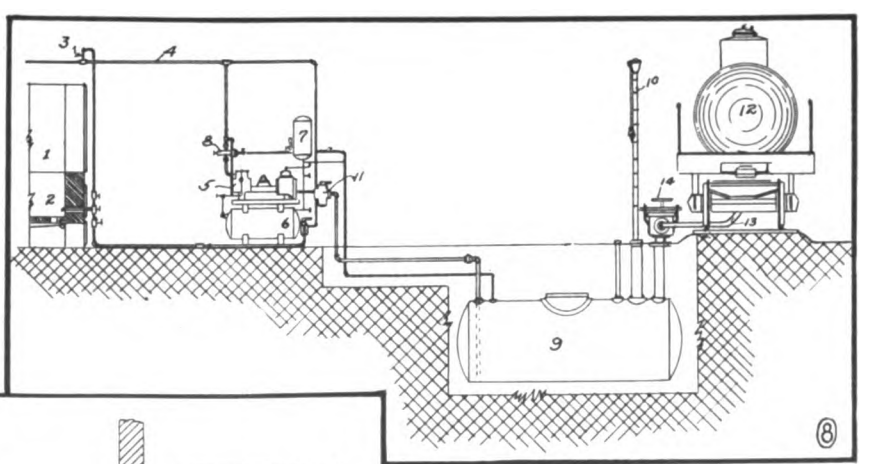


Fig. 8. An oil storage system with all its appurtenances including the unloading depot and boiler installations.

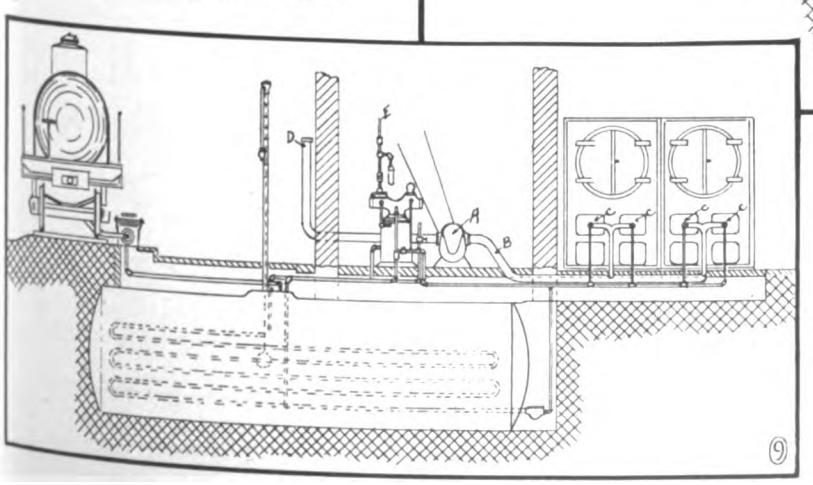


Fig. 9. An oil installation differing from that in Fig. 8 in that it uses air instead of steam for atomizing; the air being furnished by blowers shown at A.

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Have You a Painting Program?

A Systematic Plan for Plant and Equipment Maintenance

By Roy C. Sheeler

THE word "maintenance" as used in this article relates to the upkeep of plant and equipment as far as prevention of decay, rust and corrosion is concerned with the use of paint and varnish products.

The manner in which an industrial plant is maintained and the equipment cared for is frequently an index to the character and business standing of the company. Any business concern that does not maintain its physical property in fairly good condition is due for a rude and sudden awakening some day, when it is found that in order to continue in business, expensive replacement of buildings or equipment is necessary. This is frequently the case, if there is no definitely laid-out policy to take care of the maintenance needs.

The manner in which the upkeep of the plant is cared for depends largely upon the nature of the company and its manufacturing processes. In the larger companies there is always the chief engineer, the mechanical engineer, the maintenance engineer or plant superintendent, upon whom the duty falls. In the smaller companies it does not seem to be the duty of any one person. In many instances it is left to take care of itself, until called to the attention of the manage-

(*Continued on page 46*)

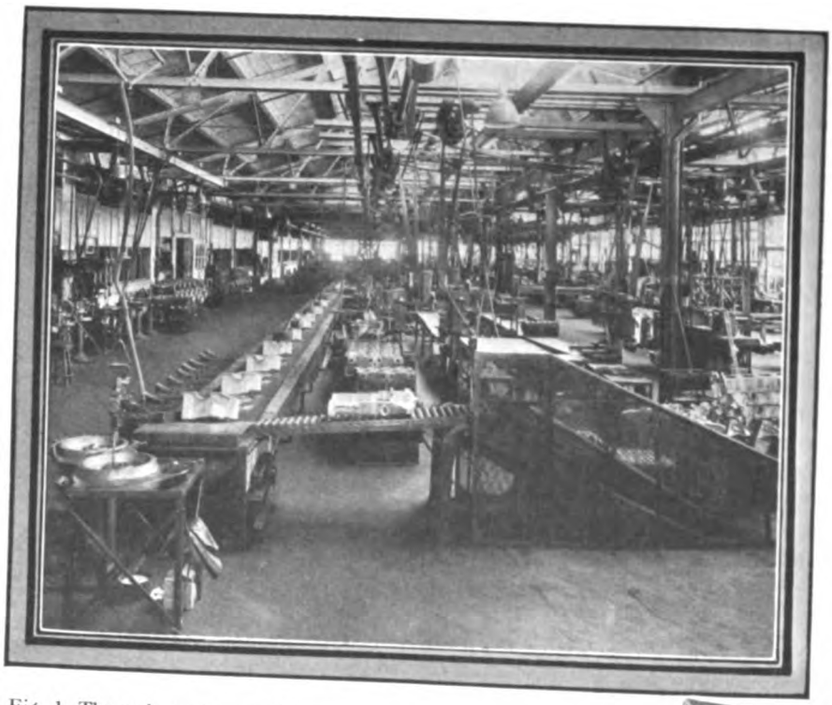


Fig. 1. The only way to make sure that no important surface is being overlooked, is to make it a standing rule to inspect all parts of plant and equipment at least twice each year.



Fig. 2. Certain large concerns make it a rule to paint one-third of their company villages each year; giving a three-year program, evenly distributed.

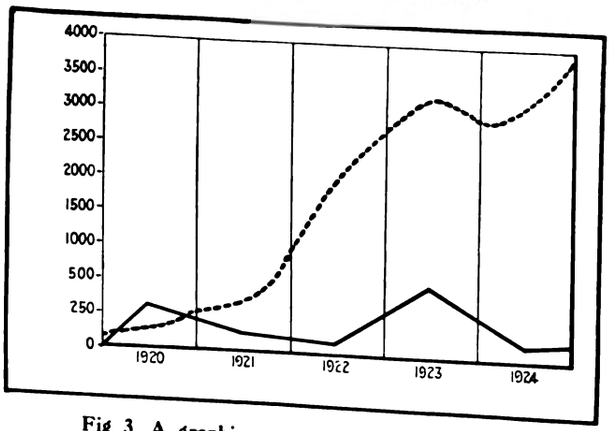


Fig 3. A graphic presentation of the result of a poor maintenance program.

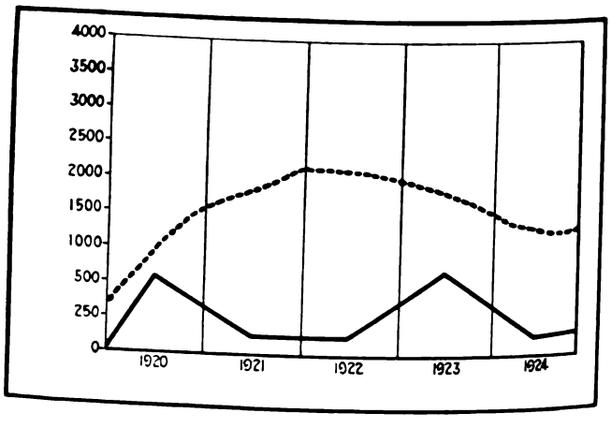


Fig. 4. The effect upon depreciation, of a three-year painting program, in contrast to Fig. 3.

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Boring Under Ground for the Factory Water Supply

Modern Methods in Deep Well Drilling

By J. G. Gordon

Formerly Chief Engineer, Layne & Bowler Co., Memphis, Tenn.

IN selecting a factory site one of the important considerations is that of water supply. Some industries require considerable water in the manufacturing process and in that case it becomes a serious question. Any plant generating its own power needs water for the power plant and all plants need it for fire protection.

The main factors to consider are quantity, cost, quality and temperature of the proposed water supply. That the required quantity must be available is self evident. For ordinary purposes the cost becomes the main item once the quantity is available. Certain plants such as chemical, paper and textile must consider the quality of the water, and ice plants and others who use it for condensing purposes find that the temperature is an important item.

In the portion of the United States east of the Rocky Mountains, well water can be produced in many localities. The possibilities of well water supply should always be investigated as it is very likely to prove the most economical source of supply and the quality of the water is usually better than surface water. The average temperature is about 60-70 degrees F. and varies only a few degrees throughout the year. The fact that 40% of the cities over 4,000 population in this territory rely on wells for their water supply is a fair indication as to the reliability of this source. The possibilities of contamination of surface water have undoubtedly had considerable influence in this selection.

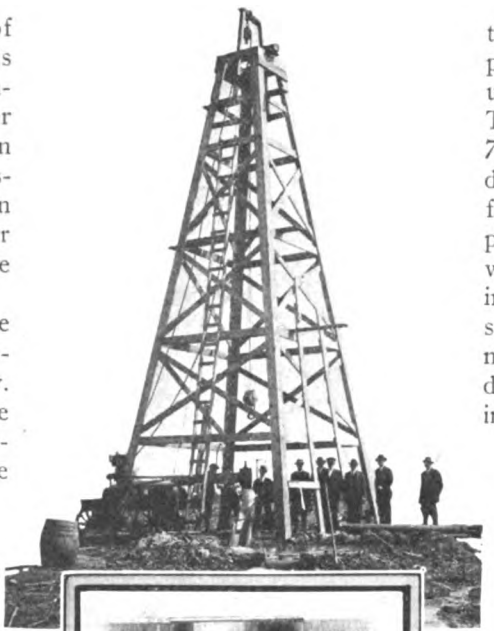


Fig. 1. A typical well-drilling derrick is shown above. This well, at West Frankfort, Ill., is about to be tested for capacity.

Types of Wells

In some parts of the country self-flowing or artesian wells are possible. These provide a very satisfactory and dependable source of supply but the territory where an artesian well can be developed is limited. The usual type of deep well ranges from 100 to 500 feet in depth and the water ordinarily stands from 50 to 150 feet below the surface of the ground when the well is not being pumped.

(*Continued on page* 55)

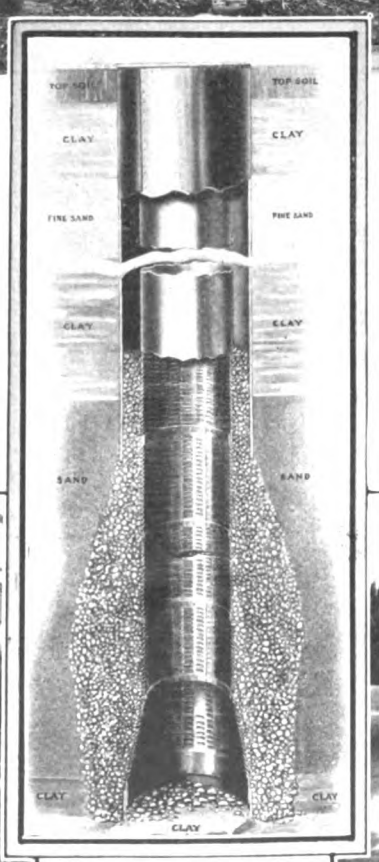


Fig. 3. Cross section, showing how the gravel wall acts to supplement the screen casing as described in the text.



Fig. 2. A gravel wall well producing 3,000,000 gallons per day for the Richardson Paper Co., Lockland, Ohio.



Fig. 4. Pumping well water over an aerator, to remove sulphur gas, at St. Petersburg, Fla.

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Industry at Water-Level, Mountain, and Farm

Manufacturing Decentralizes to Grasp New Opportunities

By John A. Piquet

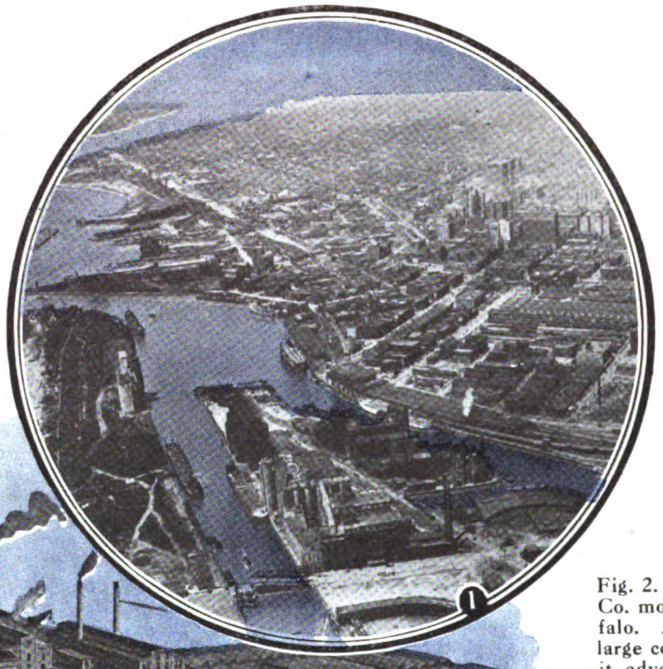


Fig. 1. The perfect marriage of rail and water is at Buffalo. Front, inner harbor, railroads, grain elevators. Center, business section. Rear, Niagara River.

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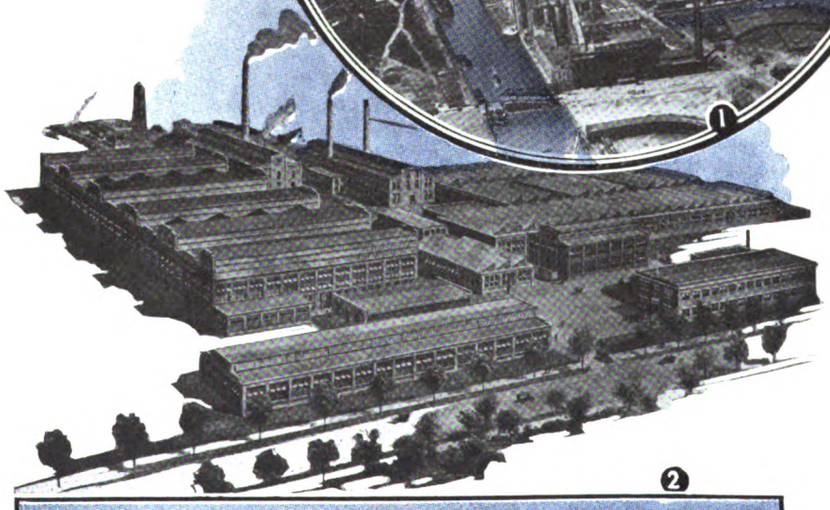


Fig. 2. J. H. Williams & Co. modern plant in Buffalo. An example of a large concern which found it advantageous to move away from their former location in greater New York.

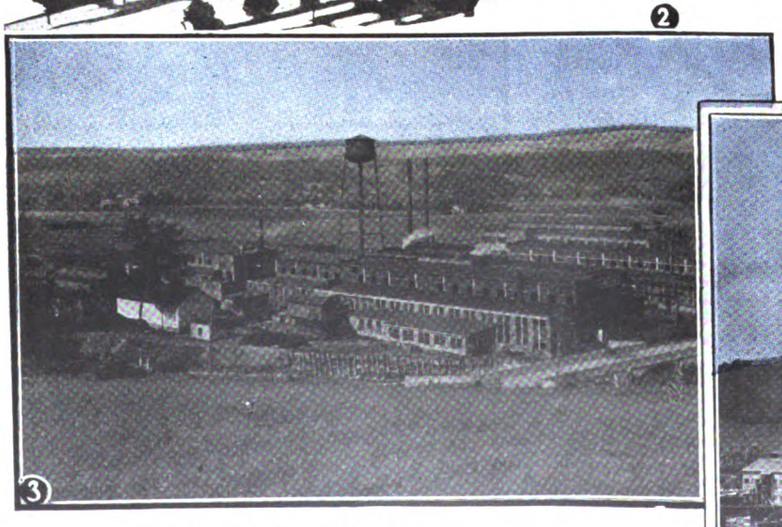


Fig. 3. The Power Specialty Co., a small firm in New York twenty years ago, moved to Dansville, N. Y., and has since grown and prospered midst skilled, reliable labor and good community conditions.



Fig. 4. The world's greatest power plant. Immortal Niagara makes the Buffalo area the cheapest large-scale power zone in the United States.

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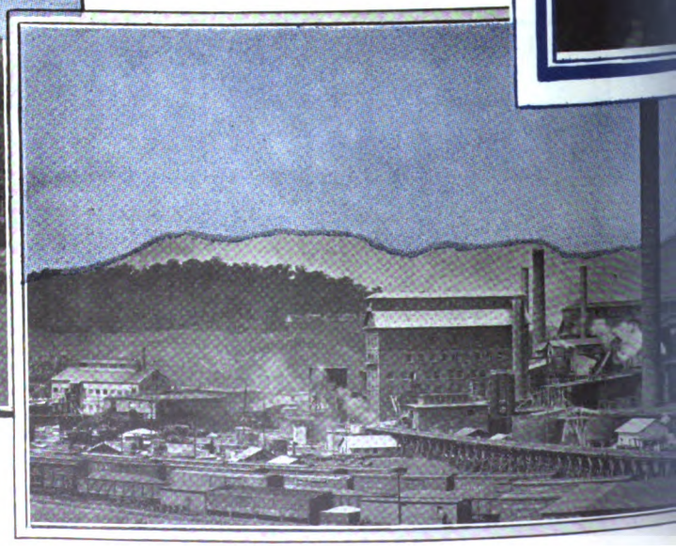


Fig. 6. Raw materials and native American labor. In this great plant of the Champion Fibre Company of Canton, N. C., in the Asheville area, the varied woods of the Appalachians are converted into paper, pulp, and chemicals.

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THE curse of all the ages, says a historian, has been the inevitable concentration of power and population in every civilization, the dominating importance of great cities like Babylon, Rome, and Paris, and the decay, first of the countryside, and then of the nation.

Western civilization lives today only because Magna Charta and the American and French Revolutions overturned centralized power and established the principle of individual liberty and home rule. Our industrial civilization fifteen years ago was sick with the congestion of manufacturing in great city slums, with the concentration of financial power, and with the illegal practices of the trusts.

The muckraking period, the World War, the rise of labor, and the opening of the Electrical Age shook American industry from head to foot, sealed the doom of overcrowded cities, and created a healthy competition, which forced manufacturers to seek the best possible locations for economical production.

Instead of New York, Philadelphia, and Boston standing supreme in general manufactures, and Pittsburgh, Akron, Fall River, Lynn and others in single industries, we now find dozens of other localities attracting manufacturers and developing rapidly because they have no cramped manufacturing, bad transportation, or labor troubles, but offer industry freedom from the evils of congestion.

Three new and significant types of manufacturing communities now held the stage—the large city at the water-level or in the valley, which has the natural manufacturing location, and has developed normally; the smal' town in the country, which is coming into its own; and the mountain plateau city, which turns into industrial assets not only its raw materials and water-power, but also climate, natural beauty, and hard-grained mountaineer humanity.

We take as typical examples of these three—Buffalo, the best located and most accessible manufacturing city in America—Dansville, N. Y., a small town that does big things—and Asheville, N. C., which has put the everlasting hills on the payroll of industrial production.

Buffalo! You stand as an example of the natural development of a manufacturing city. You owe your success to no accident of history, as do so many other cities. Therefore, your future is secure, their's more doubtful, as the scientific



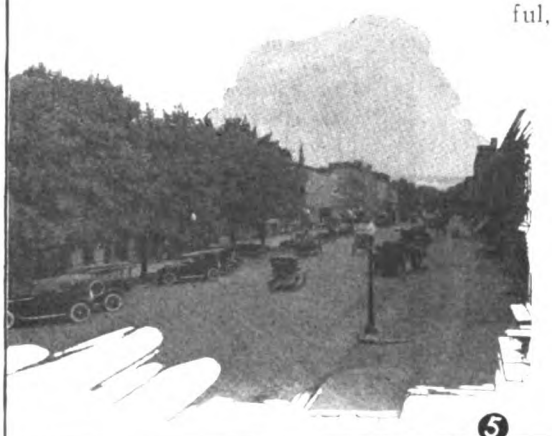
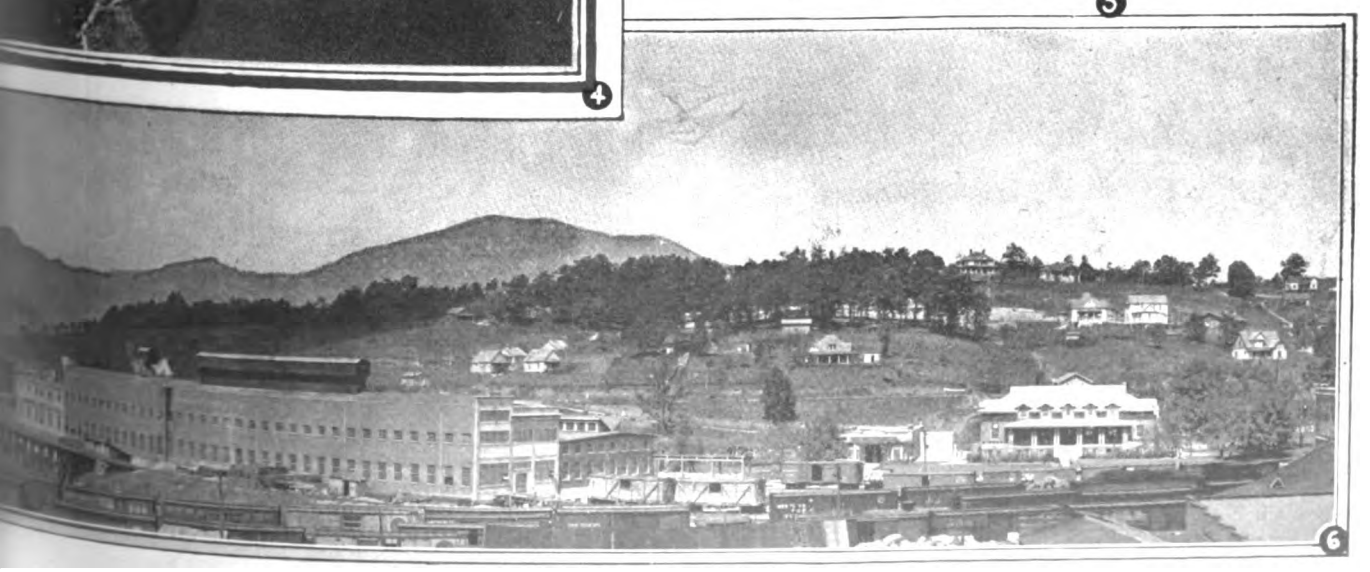


Fig. 5. Main street means coöperation Dansville, New York, is a type of the small manufacturing, farming, and home center, where industries grow fast, the human element factor being a chief cause.



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location of industry grows. You have not jammed your industries together, like New York, nor encouraged one or two at the expense of the others, like so many one-industry towns.

The Buffalo area,—there are no longer city limits today anywhere, there are areas—is the supreme example of a scientific location. Said the Dunlop Tire and Rubber Co., in establishing its gigantic plant at Buffalo after a survey of twenty-three cities, "The outstanding advantages that swung the decision in Buffalo's favor were the ample frontage on the Niagara River for dockage; water transportation to Chicago, Detroit, Cleveland and Middle West points; the 14 trunk lines operating through Buffalo; direct water transportation to New York, the leading port of entry for raw rubber; the great Niagara power; and an inexhaustible supply of water chemically suitable for Dunlop's manufacturing needs. Moreover Buffalo was found to be the center of the territory in which motorized transportation predominates.

Nearness to markets, economical access to materials, abundant and varied power and fuel, a supply of skilled and common labor, water and railroad shipment and accessible manufacturing sites—these are the essentials of scientific location, and Buffalo has them all in superlative degree. Besides, it is the natural hub of all the continent east of the Rockies and north of Virginia. All water and rail transportation focuses here, country's greatest power is present, and here is the strategic location between a growing export trade and domestic activity. A lake, two winding rivers, 14 railroads, and 5 belt-lines assure rail and water sites to multitudinous industries, which in itself is a rare achievement among American industrial localities.

Coöperation between capital and labor is the coming, indeed the present,

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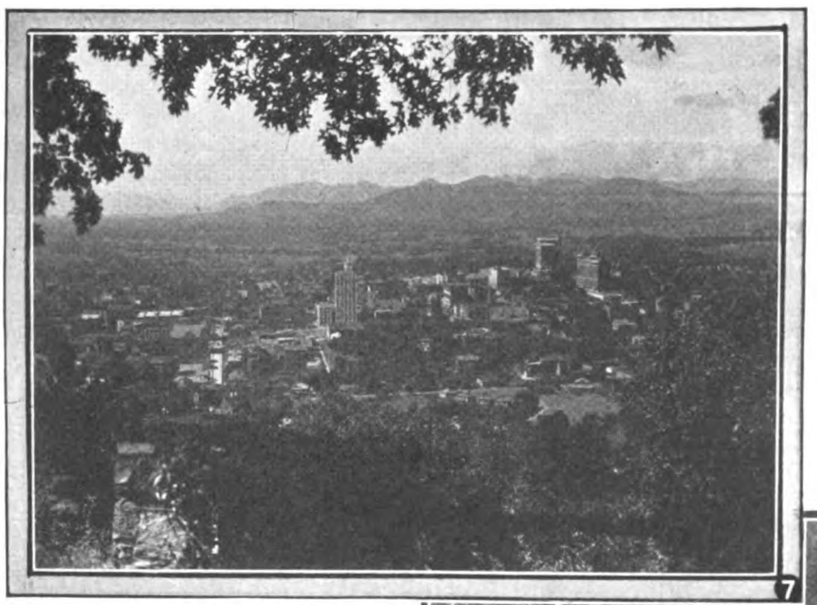


Fig. 7. This beautiful town, with its chain of hills, has a growing and diversified surrounding industry.

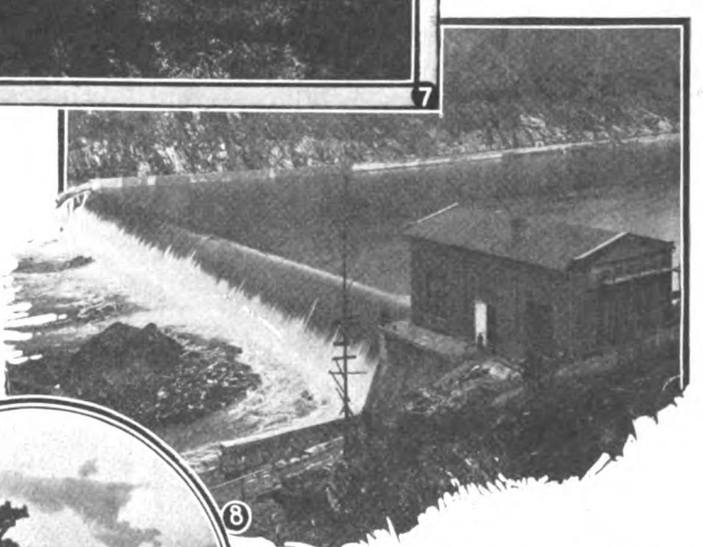


Fig. 8. The North Carolina Electrical Power Co. station on the French Broad River.



Fig. 9. The Land of the Sky. These multitudinous peaks are rich not only in pleasure, but in surpassing water-powers, minerals, and livestock.

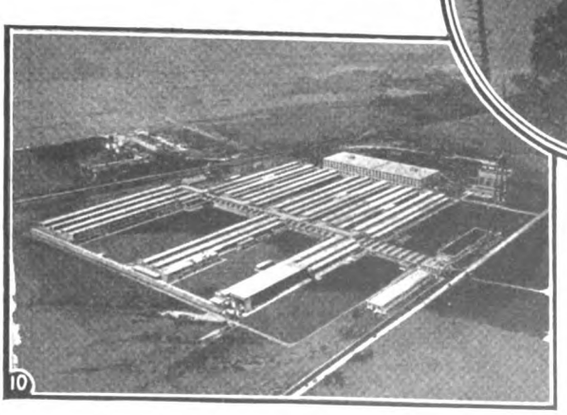


Fig. 10 The Dunlop Tire and Rubber Co. finds Buffalo the central point of large markets, diversified transportation, cheap power, and quick access to raw materials.



Fig. 11. Industry underneath the shade-trees. The F. A. Owen Publishing Co. at Dansville, N. Y., has grown to a great printing industry midst a cooperation of labor and community.

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"Seeing Is Believing"

The Visual Comparison of Belt Slip

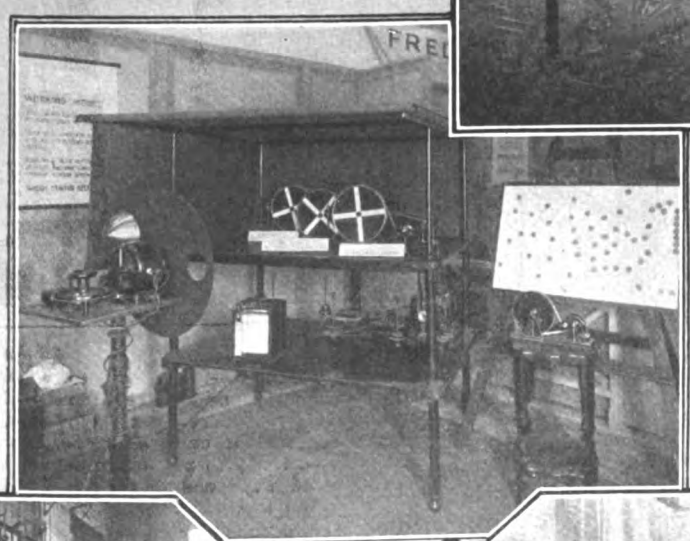
By Viggo Sahmel

THE short center belt drive is coming into wider use, due to limitations on space in manufacturing plants. Some years ago a special form of short center drive was introduced which also permits of high pulley ratios, low belt tension, high overloads and minimum belt slip. The arrangement of this short center drive differs in many respects from the ordinary long center drive. The driving and driven pulleys are placed close together. A free pulley is hinged adjacent to the smaller pulley and bears on the slack side of the belt so that it wraps the belt around the smaller pulley. The belt is of such length that the loose side is within a few inches of the tight side and the initial tension in the belt is due solely to the weight of the hinged floating pulley. The most important feature of the drive is the large arc of contact of the belt with both pulleys, resulting in increased grip of the belt on the pulleys for given initial tension and belt size. When the load is applied the belt stretches, but instead of becoming looser, the tension in the slack side is maintained constant by the free pulley, and the additional length is automatically wrapped around the small pulley, increasing the arc of contact.

At the Power Show recently held in New York City there was exhibited a device which demonstrated visually the relative slip of a short center drive of the type just mentioned and of an open belt drive, which aroused much interest on the part of belt

(*Continued on page* 34)





Figs. 1 and 2. This ingenious device makes use of a phenomenon frequently noticed in moving pictures, where one sometimes sees a locomotive pulling into a station, with the wheels apparently revolving backward. By means of a flicker lamp synchronized with each quarter-turn of a timing pulley, the lag of the pulleys under test is readily and accurately observed.

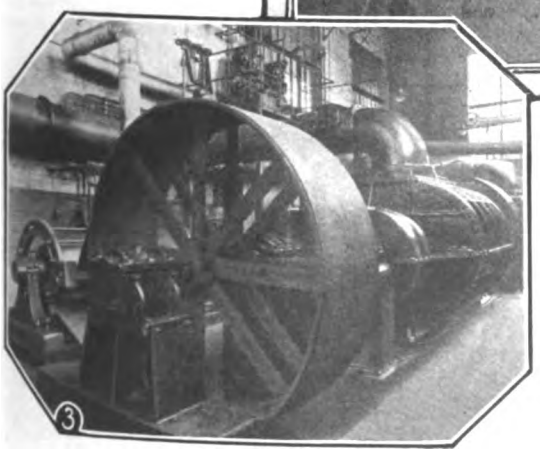


Fig. 3. Short-center drive on a 350 hp. gas booster, in a coke plant at Buffalo.

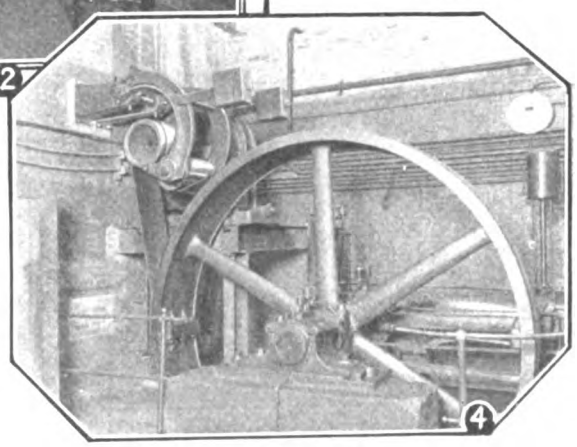


Fig. 4. Note the extreme short center drive on this 90 kw. alternator, installed at Irvington, N. J.

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Speeding Production on

A Study of Cutting Tool

By Allen

AMONG the many problems with which the modern industrial plant executive will have to deal, in connection with the operation of his works, the matter of power consumption is generally conceded as being perhaps the most vexing. Somehow or other, waste will creep in, however careful we may be in the transmission of steam and electrical energy, and the reduction of friction. The more important phases of this problem have fortunately been forcibly driven home to the Management. But certain of the so-called minor features, apparent only to a careful observer of actual operating conditions, are frequently still overlooked as of little consequence, or entirely forgotten in the consideration of seemingly more important details.



Fig. 2. A type of centrifuge extensively used for the clarification and purification of cutting oils. The compactness of this apparatus is one of the outstanding features.

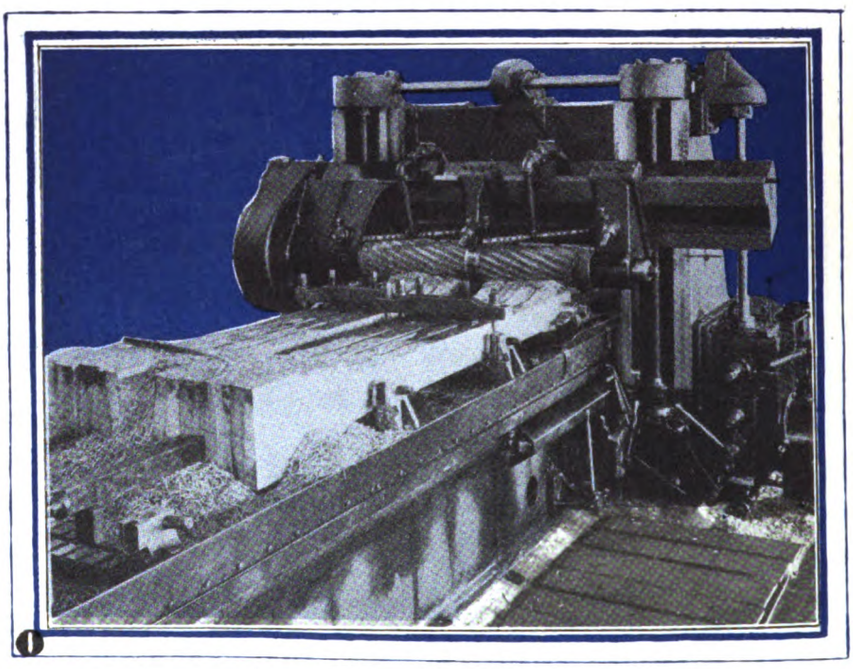


Fig. 1. How the chips or cuttings from a modern milling machine appear in actual operation. A good idea can be gained as to the intensity of the service involved, the need for a tool lubricant and coolant and the possibility for oil waste.

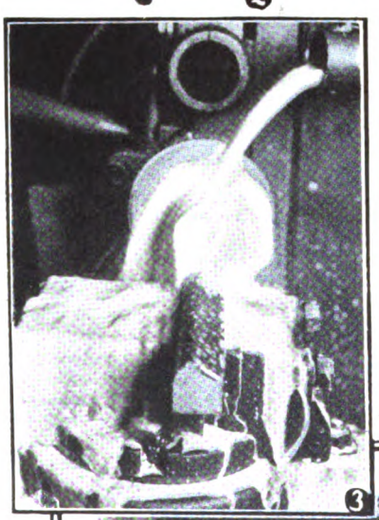


Fig. 3. At the left—Oftentimes, to the layman this might seem an extravagant procedure, but high speeds dictate that cutting be effected as perfectly as possible with minimum of wear and dulling of the tool edge.

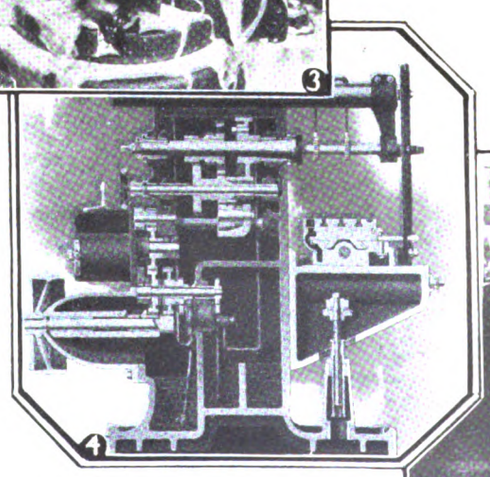


Fig. 4. Cross section showing lubrication, cutting oil, and settling reservoirs on a modern high speed milling machine.

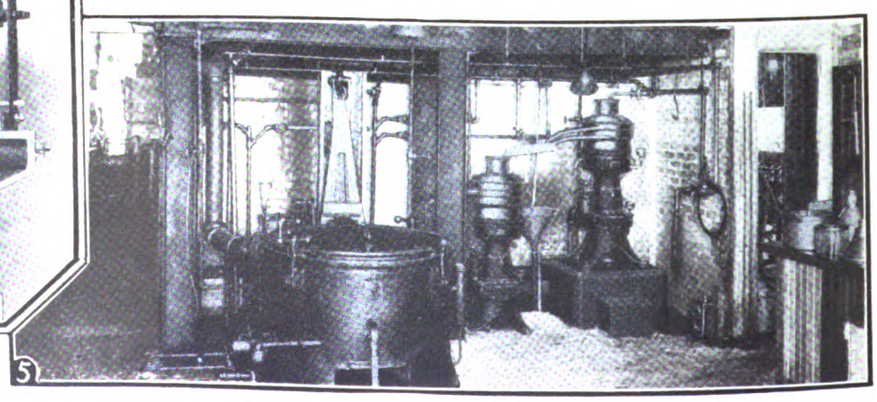


Fig. 5. A typical installation involving a steam-driven centrifugal chip extractor connected with two centrifugal oil reclaimers.

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Modern Machine Tools

Lubrication and Cooling

F. Brewer

For example, take the matter of cutting tool lubrication and cooling. Until we have actually measured the power consumption and rate of production of a modern lathe or milling machine, etc., until we have noted the extent to which such production can be increased and power consumption reduced by more careful attention to the actual process of cutting, we have no idea of the potential results attainable.

This actual process of cutting involves the forming or shaping of metal parts by means of a cutting tool of suitable shape. In other words, metal-to-metal contact exists throughout the entire process of cutting. Therefore, friction in its most virulent form is a direct probability.

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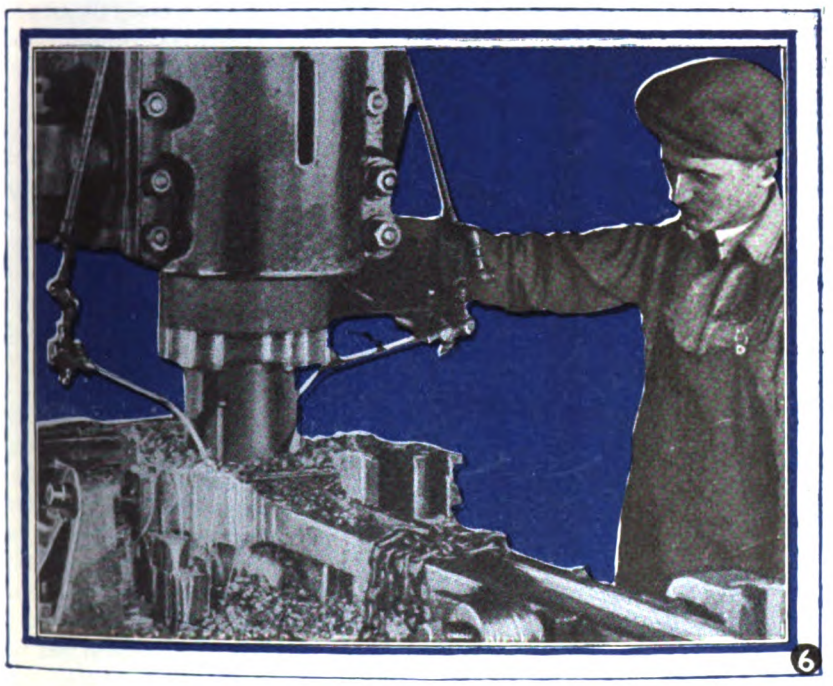


Fig. 6. Above—Boring a 6¾ inch hole in a rod 3¾ inches thick using a ¼ inch feed. Note position of two pipes for the cutting oil.

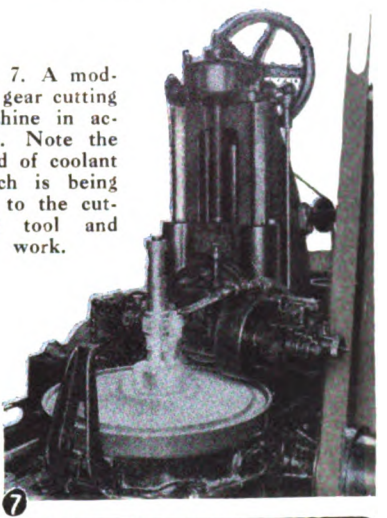


Fig. 7. A modern gear cutting machine in action. Note the flood of coolant which is being fed to the cutting tool and work.

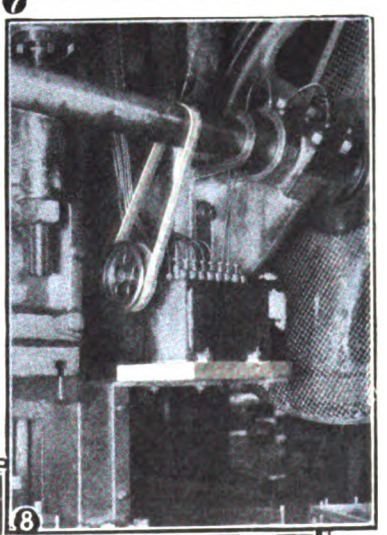


Fig. 8. At the right—Close-up view of a force feed lubricator installed on a stamping machine. Note the belt drive connection, and the compactness of the entire installation.

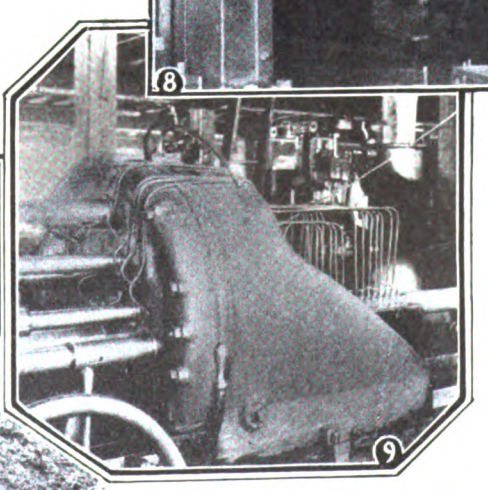


Fig. 9. A six-bar boring mill equipped with ratchet drive, force feed lubricators. The independent force feed lubricator is an excellent piece of equipment.



Fig. 10. How a pile of properly reclaimed chips should look. Before centrifugal extraction was adopted this chip pile used to be a mass of slimy, oil-soaked metal.

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Unit Heaters in Industrial Buildings

By Raymond L. Price

IN considering a heating system for a factory, there are three general types from which to choose, namely: direct radiation (steam, hot water or vapor), central fan and duct system and unit heaters.

Inasmuch as the unit system is the latest to be developed we might compare it with the other systems as to its desirability. The first cost is less than the other two systems, both as to material and installation. It has a power cost that direct radiation does not have but that is more than offset by the saving in steam consumption and maintenance, since it is possible to let room temperatures drop overnight and yet bring the building up to operating temperature in from 30 to 60 minutes in the morning. This of course, means a saving in coal.

Unit heaters are easily adaptable to plant extensions or changes. The units, being compact and portable, can be readily moved to new locations or new units can be added to existing installations. For buildings divided into several small rooms, they may not show many advantages over direct radiation. However, for large open buildings and especially those with large glass exposures or high roofs, the unit heater is more efficient and economical than any other type of heating system.

In general, unit heaters may be divided into two types—those using the steel plate or multivane type fan, and those using the propellor or disc type fan for passing the air over the heating surface. Usually the units using the propeller fan have smaller B. T. U. capacity, and consequently smaller power consumption than the units using a blower type fan.

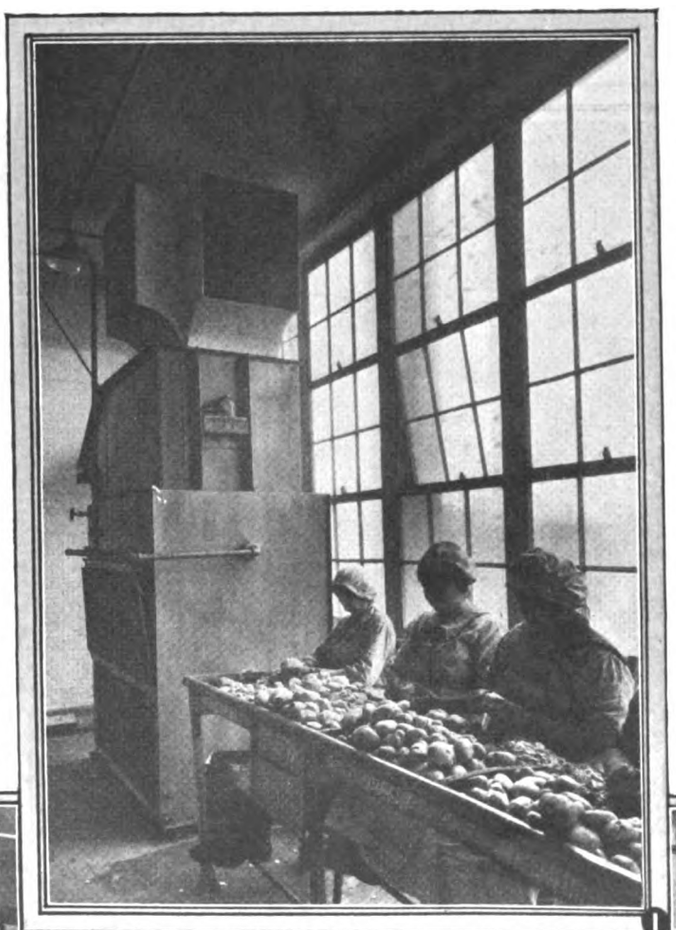


Fig. 1. A pipe coil unit heater in a food products plant. Note the workers' proximity to the heater. This unit has dampers arranged to introduce fresh air when required.

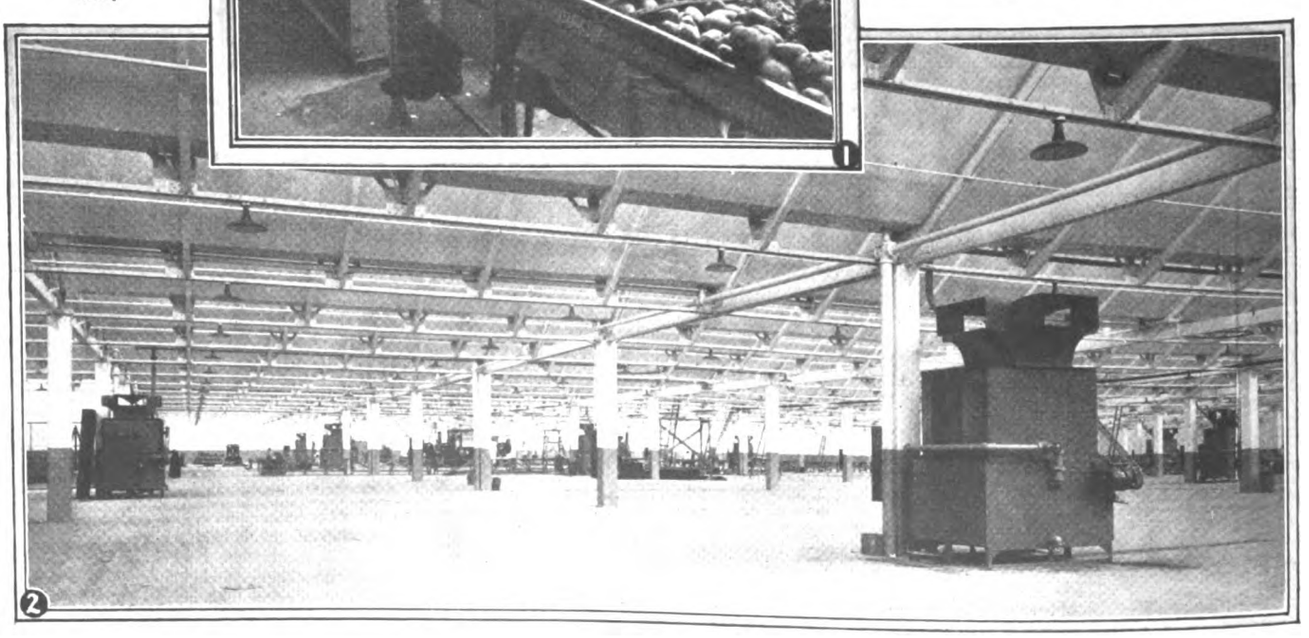


Fig. 2. Below, is an ultra-modern one-story manufacturing plant, with nearly ten acres of floor space, heated entirely with unit heaters equipped with automatic temperature control.

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In those of Figs. 3 and 5, the cold air is drawn off the floor and passed over the heating surfaces (in this case pipe coil) and discharged into the room through outlets or nozzles so designed as to give proper distribution. Figs. 1, 2 and 4 have propeller fans and pass the air over the heating surface into the room through outlets or deflectors. These latter types may be placed on standards on the floor but are more often suspended from roof trusses, columns or fastened to the building walls. The heated air should be discharged into the room at a height of 8′ to 10′ above the floor to give the most even temperature in the working space. With the units properly located, and correctly proportioned outlets, a very even temperature can be maintained, the temperature variation ordinarily being not over 5° F. in the working area. Unit heaters also show another advantage; the heated air, due to the positive action of the fan, is held down to the working area and directed against the cold walls and the cold air is drawn off the floor. This prevents the overheating of the upper levels and consequent heat loss through roof and skylights.

In mild weather it is unnecessary

(*Continued on page* 52)



Fig. 3. At the right—a pipe coil unit heater with multivane type fan.

Fig. 4. Note the simplicity of the supports for these units, heating a large automobile chassis manufacturing plant.

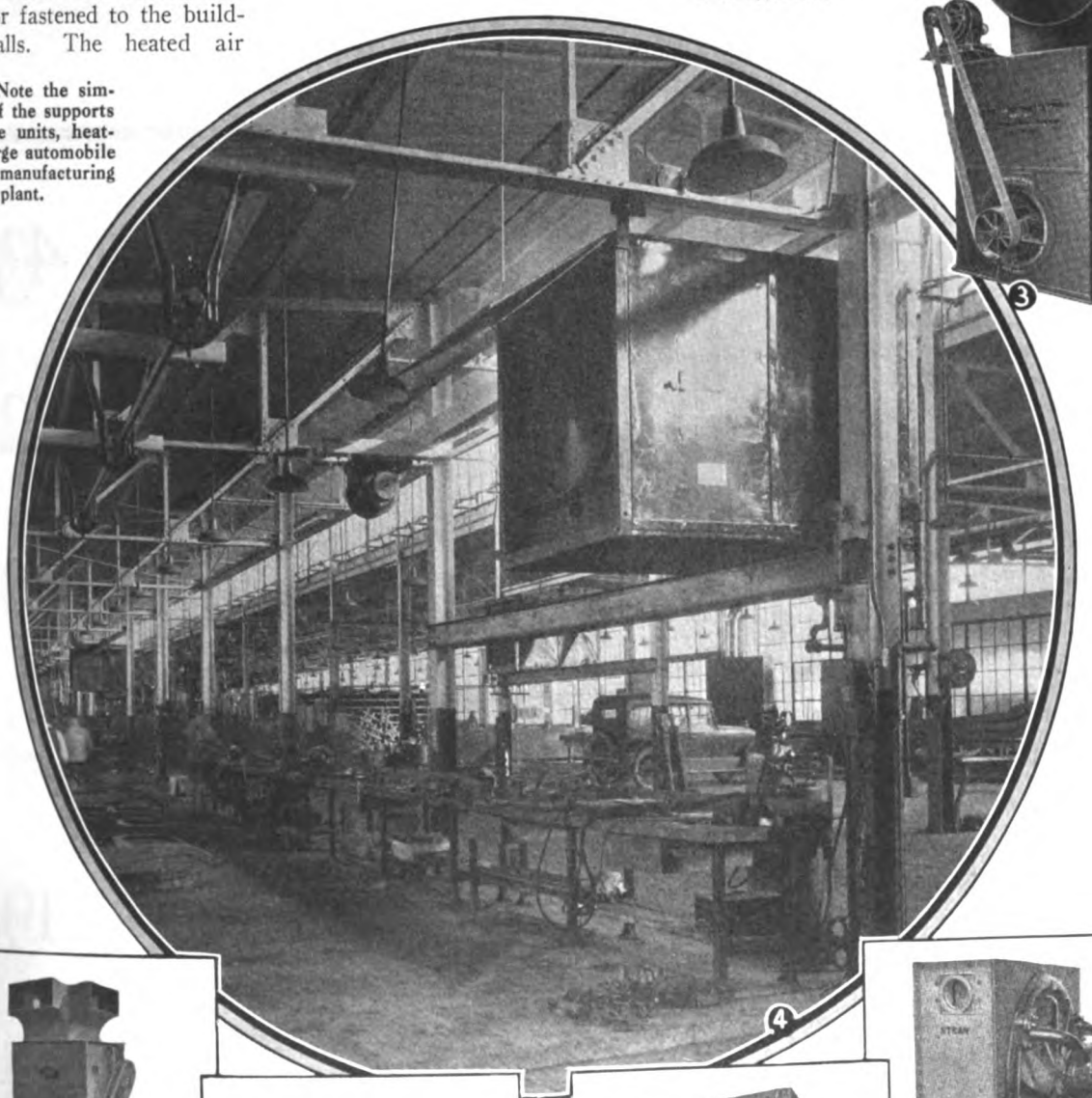




Fig. 5. Heating unit with steel plate fan and pipe coil heating surface. Cold air is drawn from the floor into the unit.

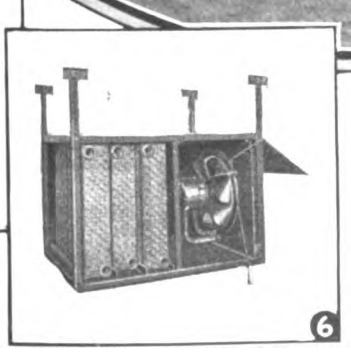


Fig. 6. A unit using a special type of heating surface, with arrangement for ceiling suspension.

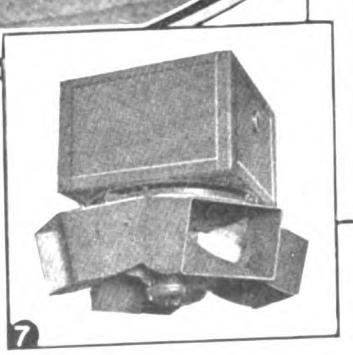


Fig. 7. Unit heater especially adapted for low ceilings, having vertical motor and special distributing ducts.

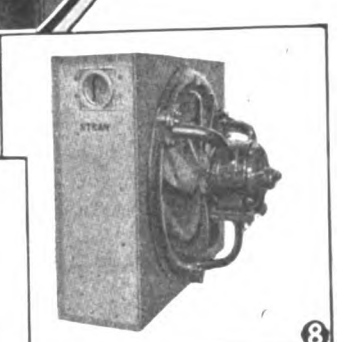


Fig. 8. This unit employs a different type of heating surface from that in Fig. 6, and has a propeller type fan.

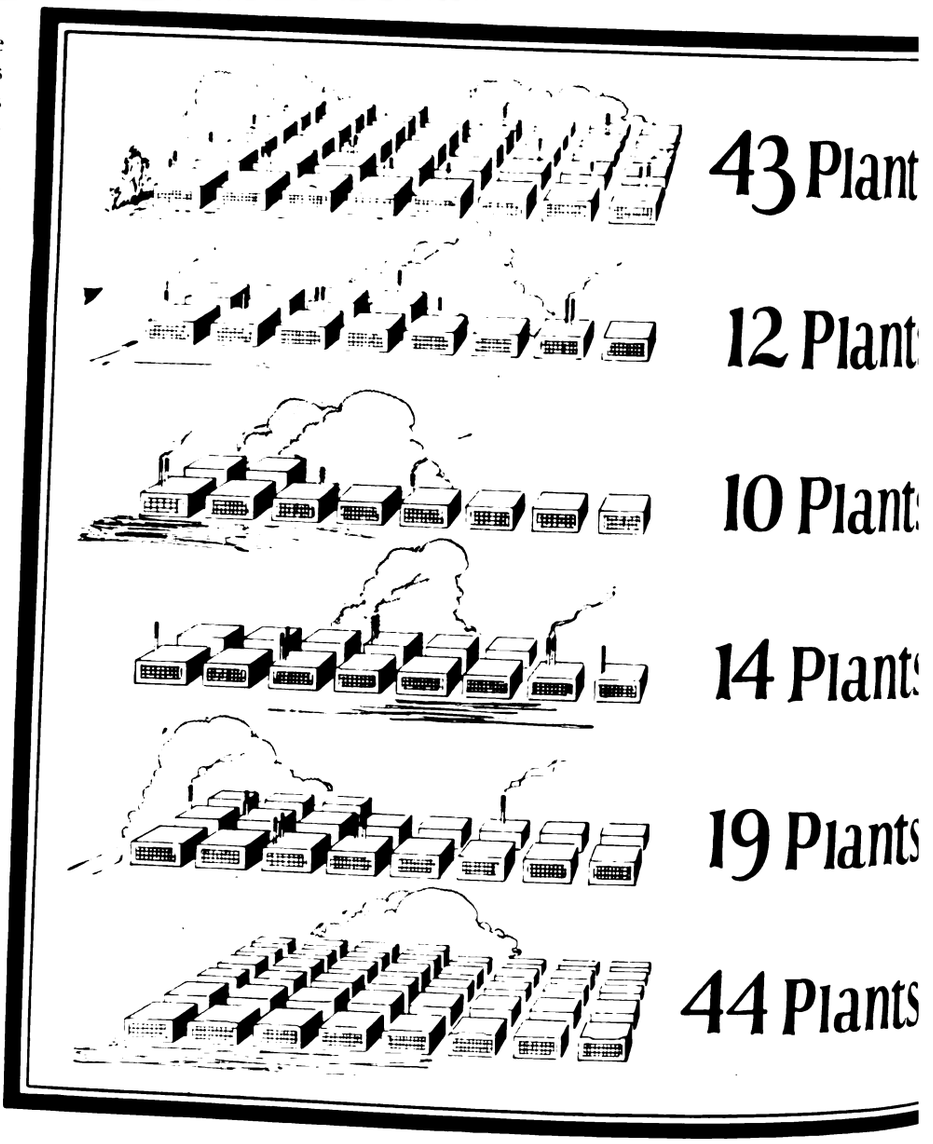
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Where Does the Averag

Graphical Results



Following is the first of a series o charts of interest to every executive do with the purchase or generation These charts will tell in a simple m



WHERE does the average plant get its power? Does it buy it or make it? Does it cost more to buy it than to make it or vice versa? These are questions that are continually coming up in the minds of up-to-date plant managers. Hitherto there has not been any very definite means of answering these questions.

INDUSTRY ILLUSTRATED recently made a survey of 142 American manufacturing plants for the purpose of finding out the answers to these questions. The results may be surprising to some who have had very definite ideas on this subject.

In the first place we found forty-three plants among the 142 which were examined which purchased no power whatever but generated 100 per cent.

We found forty-four plants which generated no power at all but purchased all of their power requirements from central stations. In between these two extremes we found fifty-five plants which made use of both kinds of service, buying some power and generating the rest of it.

Twelve of them, for example, purchase from one to twenty-four per cent. of their power requirement and generate from seventy-six to ninety-nine per cent. In this category fall those plants which use central station service for emergency of breakdown purposes.

At the opposite extreme we find nineteen plants which purchase from seventy-five to ninety-nine per cent. of their power requirements, and generate from one to twenty-five per cent. These plants use their own generating facilities to take care of peak loads and unusual demands, thus smoothing out their requirements for purchased power and avoiding surcharges for peak demands.

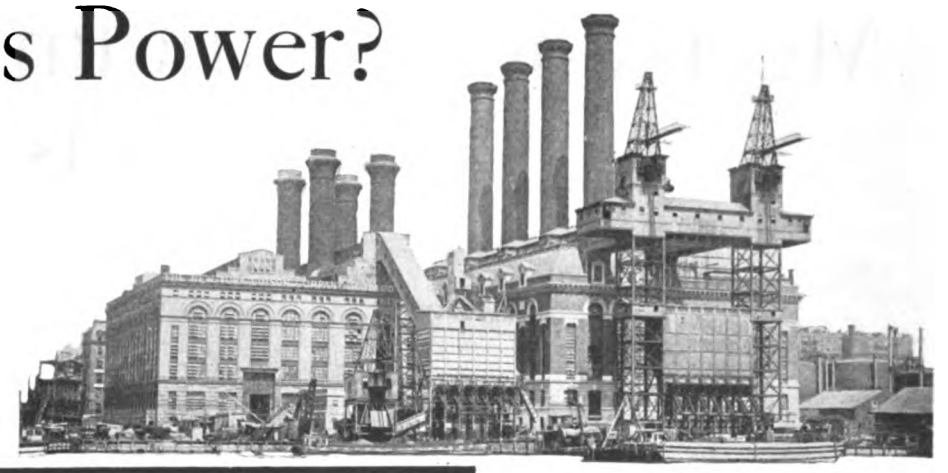
In between these two classes again are a number of plants which average some fifty per cent. purchased and fifty per cent. generated power. These plants find that it does not pay to purchase all of their power because of their need of steam for plant and process heating, for which they must in any event maintain boiler plant equipment. In summer it may pay them to purchase a larger proportion of their power than in winter. The answer to this depends of course on how favorably they are situated with respect to securing power from central stations at a reasonable cost.

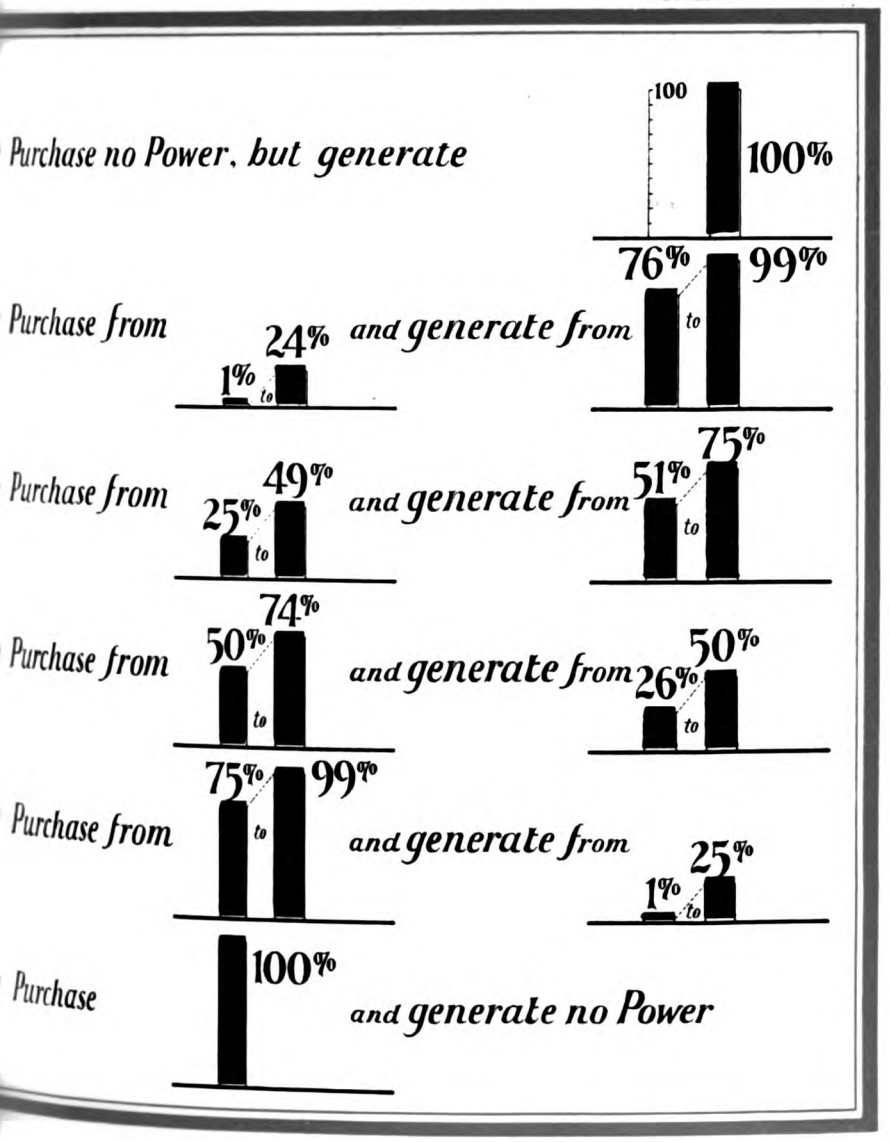
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Plant Get Its Power?

...rvey of 142 Plants

...ers never before revealed concerning a ...o overlooked source of profits. They ...the way to worth while economies in the ...e most important commodity —power.





How do the costs of purchased and generated current compare? The average cost of current purchased, as reported by sixty-eight of these concerns, is three cents per kilowatt hour.

The average cost of current generated, as reported by thirty-seven concerns, is approximately two and four-tenths cents per kilowatt hour.

Where a concern purchases all of its power the unit cost is somewhat reduced because of the greater average current consumption. Twenty-eight concerns which purchase 100 per cent. of their current report a unit cost of two and four-tenths cents per kilowatt hour.

While there is very little difference in unit cost between power purchased and power generated, it must be kept in mind that where steam is required, even at low pressure for plant or process heating, the power may be generated as a by-product. Nearly as much coal must be burned, in other words, to supply the heating and process work in the average plant, whether or not this steam is first used in engines or turbines to generate power. It takes very little more coal in fact to turn water into steam and raise this steam to 100 or 150 pounds pressure, than to turn the same amount of water into steam at five or ten pounds pressure.

Central station service is reliable and convenient but until public utilities of this kind find some way to supply plants with heat as well as power, industry will continue to retain and use the private power plant. Good judgment in management consists in making best use of available facilities, and of using both central station service and private power plants to the extent that most economical performance dictates. This can only be arrived at by making a careful study of rates, conditions, and plant demand and of looking at the problem from many different angles.

That this study is well worth while is indicated by the fact that power in the average American industrial plant requires an expenditure equal to twenty-five per cent. of the average total pay roll. Most plant managers give very great scrutiny to the pay roll to make sure that it does not carry unnecessary or useless burdens. There is even more likelihood of saving by careful scrutiny of the neglected subject of the cost of power.

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Mechanical Handling Blazes New Trails

Saving Time and Labor in Charging Cupolas

By Matthew W. Potts.

HANDLING of materials is the paramount industrial problem of today and will continue to be until a very high degree of mechanical efficiency is obtained. Considerable has been said in reference to the shortage of common labor in relation to this particular problem, but other important items now being given consideration are the necessity of cost reduction, safety and better working conditions. For a long time materials handling equipment has been known as labor-saving equipment, but under present conditions, and conditions which will exist for the next five or ten years, this equipment will come into its own on the basis of savings in money, time, and space.



Fig. 1. Former method employed by foundries for handling materials to cupolas. Notice load on elevator in the background.

Every industry has a particular difficult handling problem. Some industries have discovered these problems and set about to effect a mechanical solution, but others, due to the executives' proximity to their particular problems, are not able to see them, and for this reason materials handling manufacturers are now blazing new trails in connection with more efficient handling methods in practically every industry. To illustrate one point in particular, we show herewith the handling methods recently installed by the International Motor Company at their New Brunswick, N. J., plant for the charging of cupolas.

To describe present methods employed by various foundries would be difficult, as conditions



Fig. 2. New method of loading charge of scrap metal in individual buckets. Observe the scale mounted on the electric truck.



Fig. 3. The electric truck places skid loads under the telpher runway. They are easily picked up by the telpher operator.

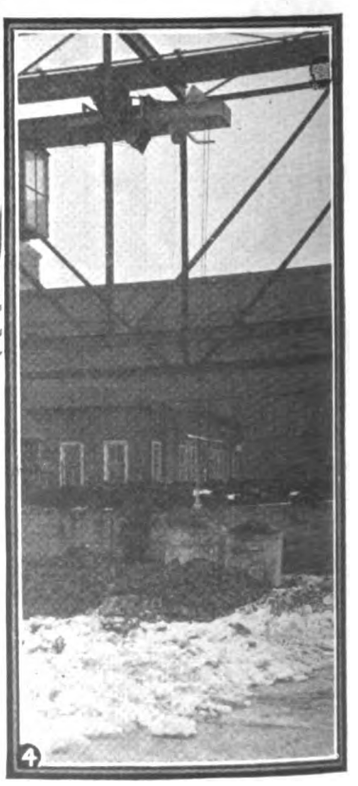


Fig. 4. Method of loading coke to charging buckets. The coke pile being under the telpher runway eliminates additional transfer by other equipment.

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alter the details in each installation. We, therefore, show in Fig. 1 the former method employed by this company for raising their materials to the cupola charging floor. In the background is a hydraulic elevator containing a wheelbarrow full of coke, which is to be raised to the cupola charging floor. The truck loads of sprues are waiting their turn to use the same lift. All other metals and materials had to be similarly elevated by the one elevator. This required a number of wheelbarrows and trucks as well as approximately six men to do the necessary handling, and was rather slow, tedious work.

The method of transporting materials from the storage yard to the cupola charging platform is now done mechanically as shown in the accompanying illustrations. Fig. 2 illustrates the method of loading the charging buckets and weighing the materials at the stock piles. It will be noted that a scale is mounted on the electric truck platform and on this scale the bucket is loaded by two men. Time studies show that a charge weighing

(*Continued on page* 40)



Fig. 5. Load of coke within the cupola prior to being dumped.



Fig. 6. In this foundry coke is handled in bottom drop buckets. This shows the bucket emerging from the cupola after the load was dumped.

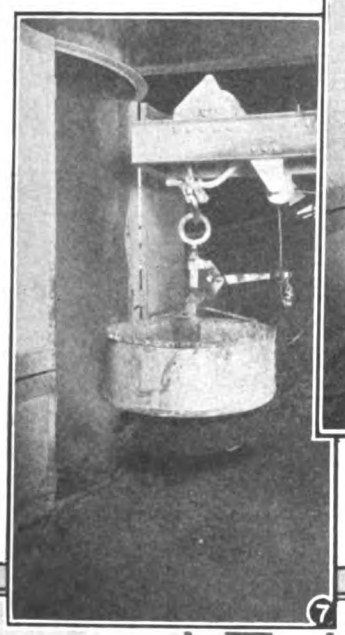


Fig. 7. In this foundry scrap and pig metal are handled to the cupola in umbrella type dump buckets. This shows the bucket withdrawn from the cupola after being dumped.

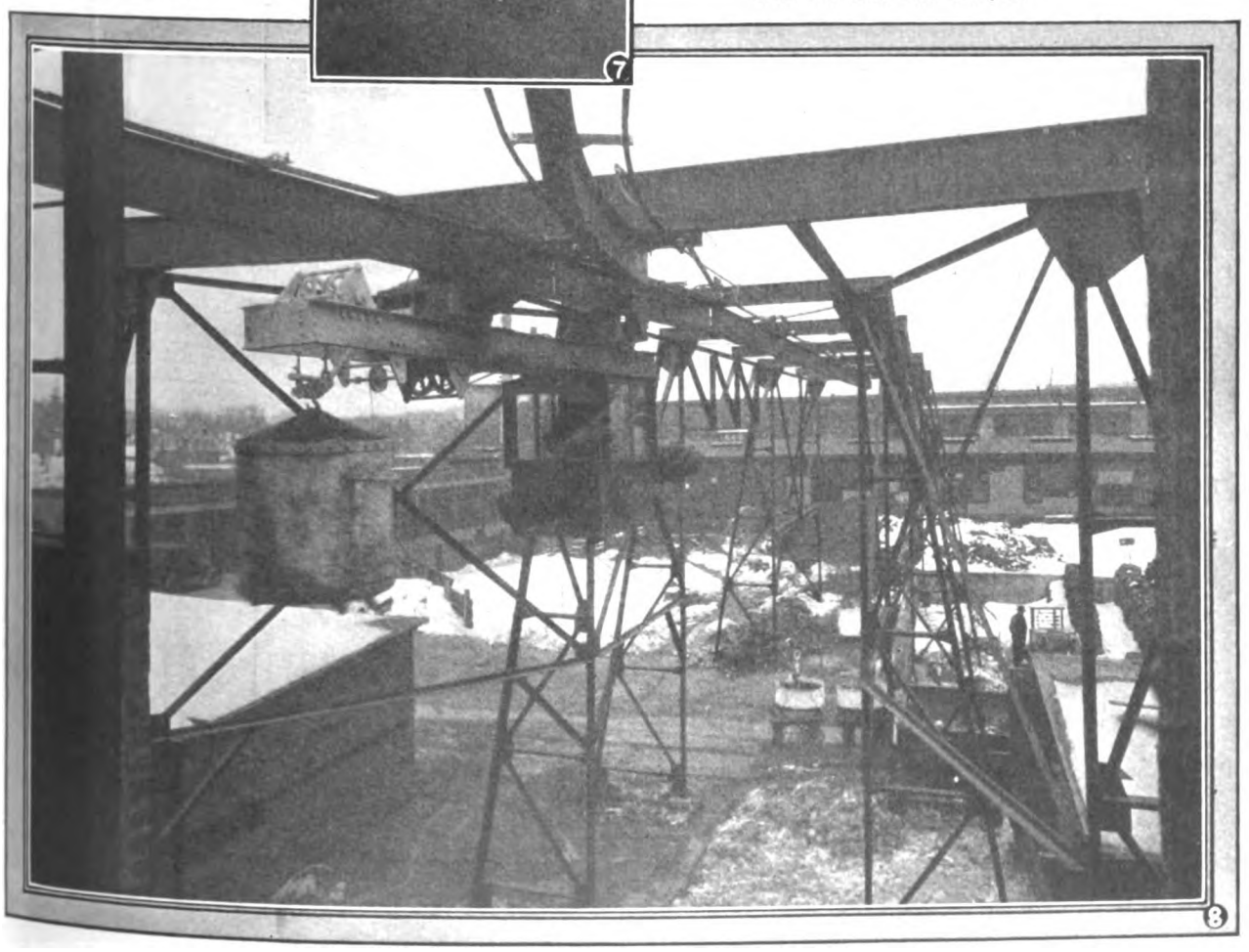


Fig. 8. View taken from cupola charging platform showing monorail telpher hoist, runway and materials storage yard.

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What Management and Machinery Have Done for Labor

Shorter Working Hours in the Manufacturing Industries

By Leroy E. Peabody

ABOLITION of the twelve-hour working day in the major steel mills, which was undertaken one year ago today, has resulted in a decided improvement in social conditions while *not appreciably affecting production*, and the seven-day labor week is no more prevalent than before the change.



It is certainly true that the hours of labor in the manufacturing industry as a whole, have been materially lessened since 1909. If the smaller number of hours have not been accompanied by a smaller production, then the "progress" of labor is real. If such be the case, the shortening of the hours of labor might well be considered as one measure of social advance.

Hours of labor in the manufacturing industry have been reduced continuously since 1909, in both small and large industries. Coupled with this reduction in the hours of labor there has been an increase in value added by manufacture per wage earner that is, in most cases, in greater proportion than the reduction in hours. The shorter day has not meant a reduced output, but an increase in the value added by manufacture even when increased prices of products are taken into account.

The classifications of hours of labor given in the Census of Manufactures are eight in number: 44 hours per week and under, 44 to 48 hours per week, 48 hours, 48 to 54 hours, 54 hours, 54 to 60 hours, 60 hours, over 60 hours per week. The multiplicity of classifications make comparison difficult, so I have merged them into three: 8 hours per day and under, 8 to 10 hours per day, and over 10 hours per day. These refer to hours per day in a six-day week.

This progress toward shorter hours

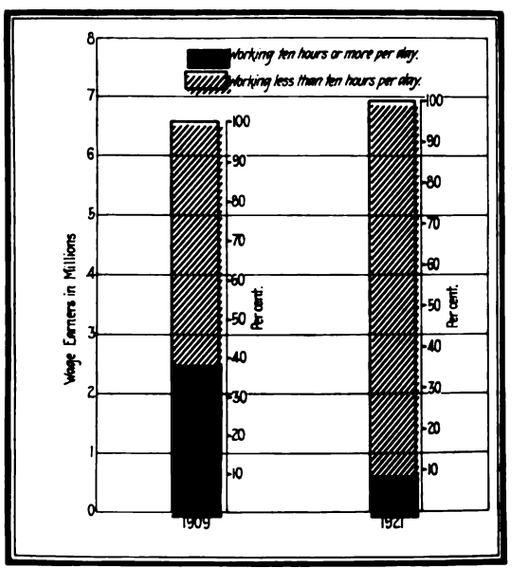


Fig. 1. The increase in total workers in industry from the census years 1909 to 1921 was from 6,600,000 to 6,900,000; while those working 10 hours or more per day decreased as shown above.

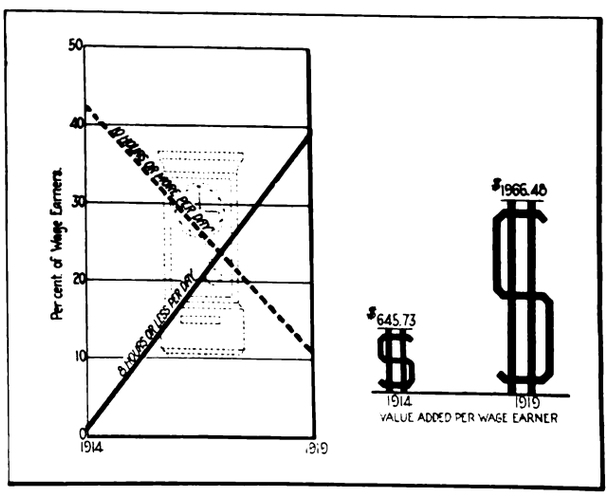


Fig. 2. In the cotton goods industry, the sharp decrease in working hours was accompanied by an almost three-fold increase in the value added per wage earner.

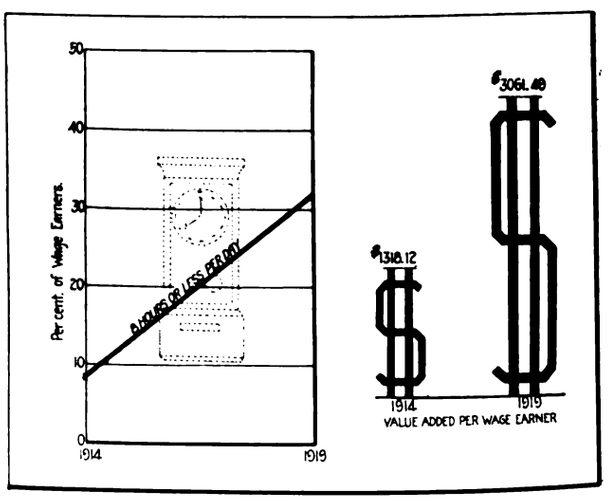


Fig. 3. The increasing percentage of workers in the 8 hour group, in the iron and steel industry seems to have had a stimulating effect upon production.

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of labor is extended to practically all industries—both large and small. Since there are in the neighborhood of 400 separate industries listed in the Census of 1921, for purposes of comparison I have selected those industries that employ 100,000 or more wage earners and considered them large industries. There are twenty such industries in 1919 and 1921 comprising identically the same individual industries in both years. In 1914 there are nineteen such industries—Motor Vehicles and Paper and Wood Pulp in 1914 had not 100,000 employees, while Brick, Tile and Terra Cotta had over 100,000 employees in 1914 and less than that number in 1919 and 1921. The total number of employees in large industries and small industries is very nearly equal; averaging 3,997,000 in large industries and 3,696,000 in small industries for the three census years.

A comparison of large and small industries (Figs. 5 and 6) shows that the tendency toward a shorter day has been strong in both.

Value added by manufacture is defined by the Census as the difference between the value of the products and the cost of the materials. The statistics of value added by manufacture are particularly valuable because they are almost entirely free from the duplication that inevitably appears in the total value of products.

Value added by manufacture per wage earner in a measure of the productive effort of the wage earner. It is affected by the capital in equipment provided for each wage earner, the

(*Continued on page* 36)

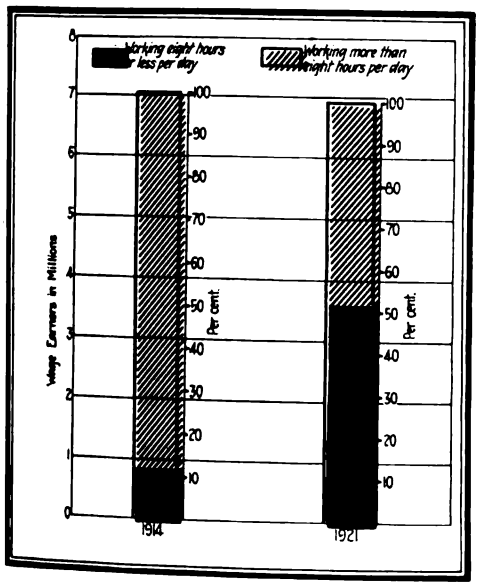
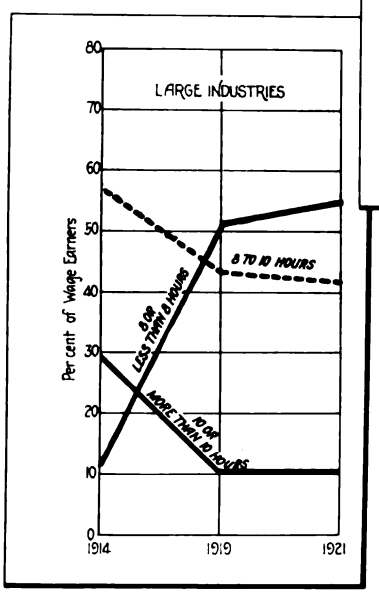


Fig. 4. A comparison for the census years 1914 and 1921, of total workers in industry in the United States. Note that the greater part of the change shown in Fig. 1 occurred in the last few years.



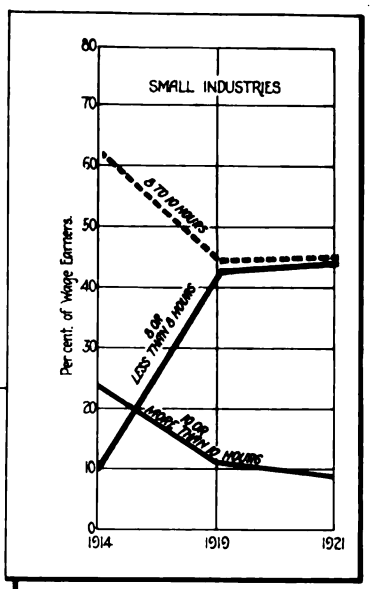


Fig. 5. Above is shown the trend in working hours of industrial employees in small industries (See Fig. 6).

Fig. 6. At the left, the trend in working hours in the large industries, showing a leadership in "big business" toward the shorter working day.

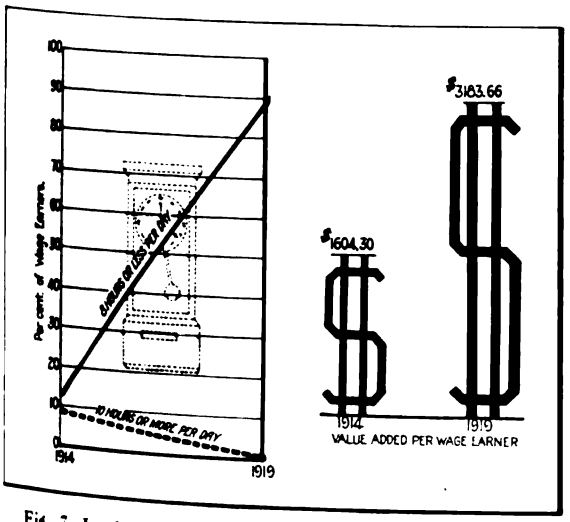


Fig. 7. In the clothing industry, taking prices into account, shorter hours were not accompanied by an increased production. Note however, the almost complete revolution in working hours.

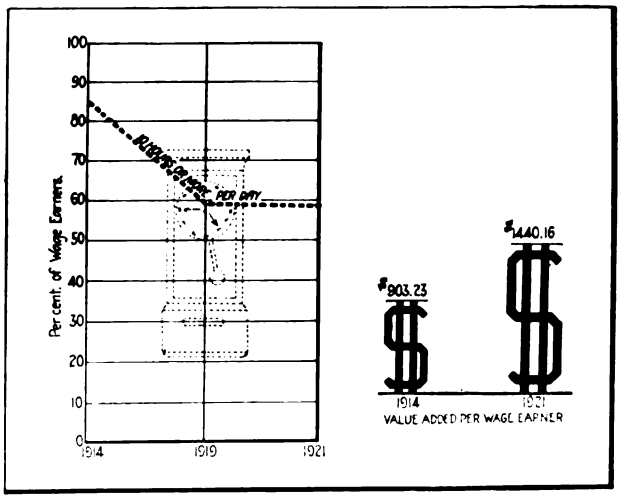


Fig. 8. In the lumber and timber products industries, a majority of workers has always been in the group of 10 hours or more per day. Oddly, this classification shows the least increase in production per worker.

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How Machine Telephone Switching Works

By Francis A. Westbrook

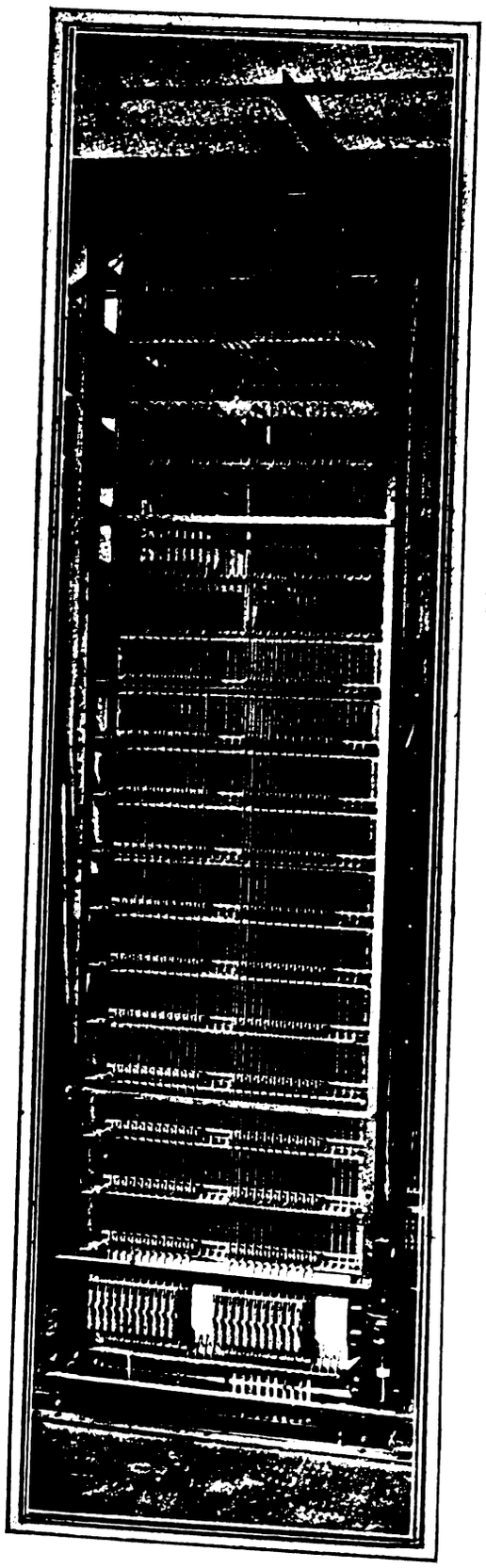
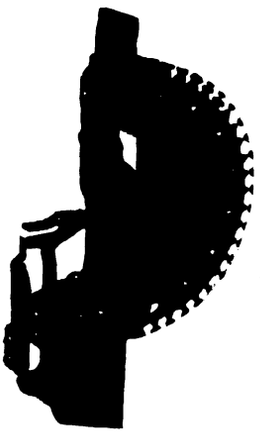


Fig. 1. At the left is a "line finder frame," showing the selecting mechanisms. See the diagrams, Figs. 3 and 4.

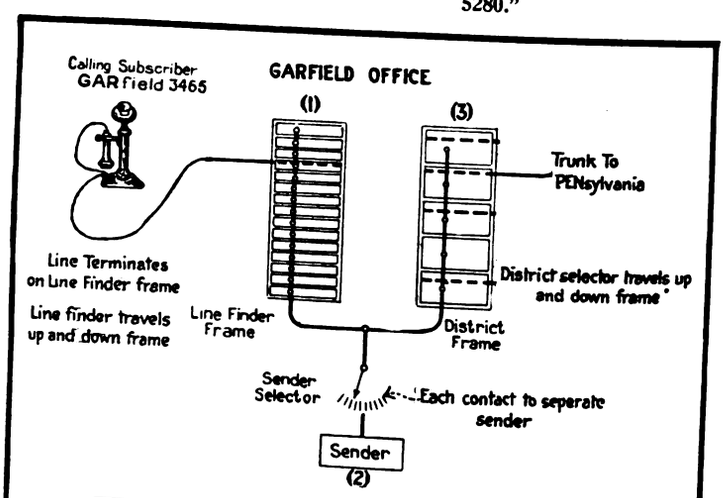
Fig. 2. Below—a close-up of rotary switch used on the sender selector.



ALTHOUGH the operation of making a telephone connection by means of mechanical and electrical apparatus without the intervention of any human agency would seem to be a very complicated affair, the actual steps are not difficult of comprehension. Naturally, the development of a mechanical switching system which can be made to operate on the scale required for New York City is an undertaking of great difficulty and is the result of much time and money spent on research and experiment. As so often happens, when once a successful solution has been reached of some well-nigh unsolvable problem, one

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Fig. 3. The sequence of operations at the Garfield exchange, when a subscriber there calls the suppositious number "Pennsylvania 5280."



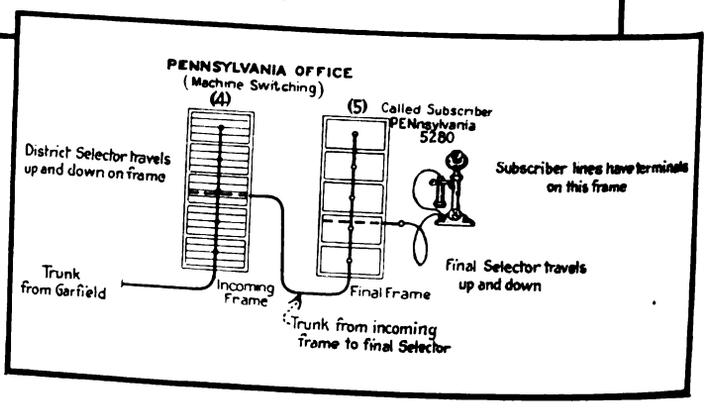
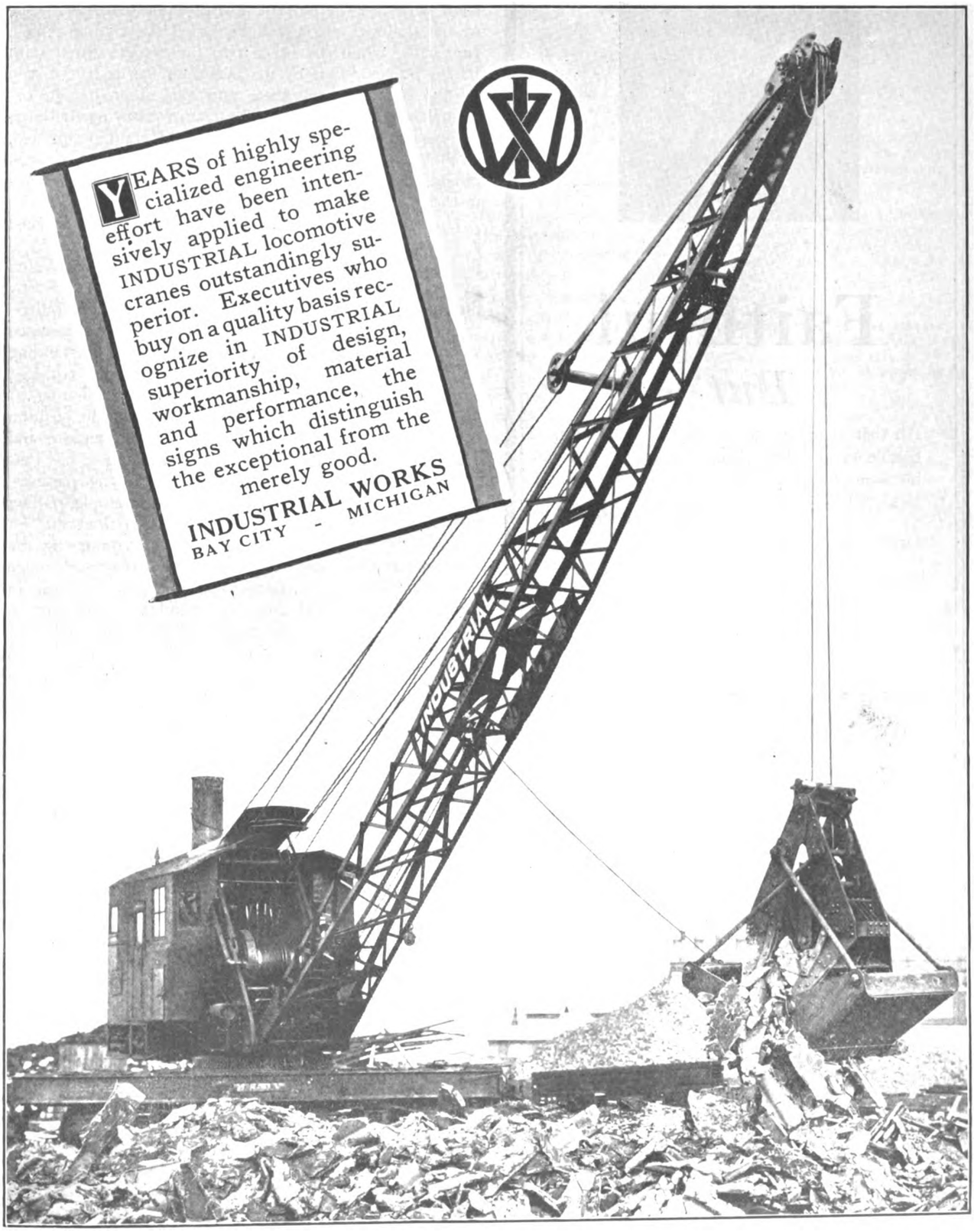


Fig. 4. Sequence of operations at Pennsylvania exchange, for completion of the call shown in Fig. 3.

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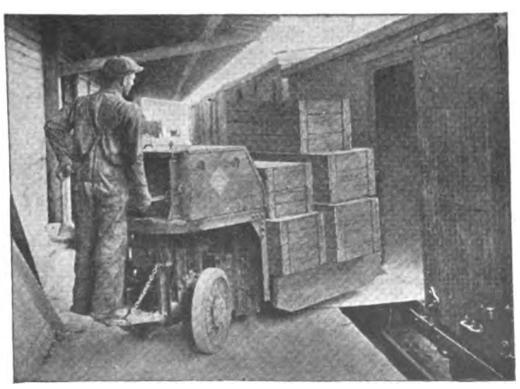
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"Seeing Is Believing"

(*Continued from page* 21)

users and engineers generally, not only because of its bearing on belt drives, but also in itself as a method for comparing the speeds of rotating or reciprocating parts.

A motor driven line shaft carries three small pulleys of equal diameter, which are connected respectively by belts to three large pulleys, also of equal diameter. One of the pulleys, which will be called the timing pulley, runs free, while the other two pulleys are fitted with Prony brakes. One of the brake pulleys is belt driven by the short center drive and the other by an ordinary long center drive. The frames carrying the large pulleys are balanced upon pivots and counterweighted, so that equal bearing pressures can be produced on each pulley bearing and approximately equal initial tensions in each belt.

Upon the web of each of the large pulleys is marked a white cross. The three crosses are illuminated by a flicker lamp synchronized with each quarter revolution of the timing pulley. If the two pulleys carrying Prony brakes are running at the same speed as the free pulley, the crosses upon each of them will always be illuminated when in the same position and will appear to be standing still, but if the two brake pulleys are going, say 1%, slower than the timing pulley, each cross will then be .01 of the circumference of the circle behind the position occupied at the time of the previous illumination, and will appear to the eye to be rotating backward. This phenomenon is frequently noticed in moving pictures, where we have all seen a locomotive, for example, pulling into the station with the wheels spinning backwards.

The actual slip may be computed by comparing the time of one backward revolution of the observed image of the cross with the speed of the pulley. The slip in per cent. is then 100 times the number of revolutions made by the cross in a minute divided by the number of revolutions made by the timing pulley in a minute. As the lag behind the timing pulley is cumulative, the magnitude of the slip may be determined with almost any degree of accuracy required.

When this test was first proposed and the apparatus set up, the delicacy of this method was not appreciated and only ordinary care was given to obtaining equal pulley ratios. The pulleys were first made with crowns in the usual way, but it was found that the belts would work to the side of the pulleys and thus change the effective diameter of the pulley and consequently the pulley ratio. Accuracy in ratio of the pulleys was obtained by turning all at one operation and without crowns. Although the results were improved it was still impossible to make all three crosses remain stationary at no load, until it was suggested that possibly the belts were not of equal thickness, and belts made from tracing paper and of uniform weight were substituted. A heavy load could not, of course, be carried, but the results were at least consistent. By careful selection of leather and by buffing the belts to uniform thickness, the desired results were, however, finally obtained with leather belts. It was also noticed that belts did not give the same results when turned hair as when turned flesh side to the pulley, but that the neutral axis of the belt (and therefore the mean effective diameter of the pulley) is closer to the hair than to the flesh side of the belt.

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Materials Handling FORUM.

Conducted by *Matthew W. Potts*

This Forum provides a place for the discussion of materials handling problems of general interest.

Each question published will be answered on the basis of our experience and available information. Further discussion of these problems will be welcome, and we will publish such letters as, in our estimation, contribute to a clearer understanding.

Question No. 23.

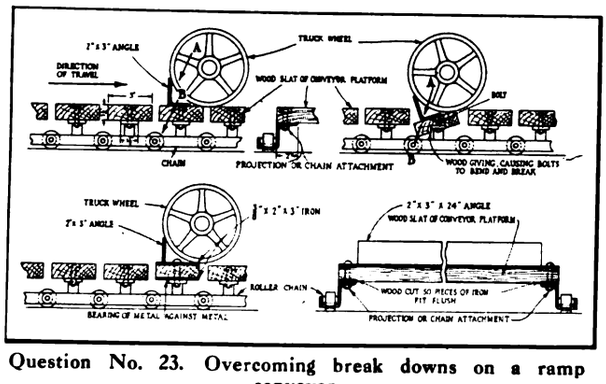
I thought the readers of the Forum might be interested in the following experience which the writer had in connection with the installation of what is commonly called a ramp conveyor.

This conveyor is used to elevate loaded stevedore hand trucks from the warehouse floor to a car loading platform. The moving platform of the conveyor is 30 inches wide and set at an angle of 17 degrees. Slats of the platform are bolted to roller chains; the chains being located one at each end of the slats so they can run on angle iron tracks. At regular intervals, approximately every four feet, a two-inch by three-inch angle, twenty-four inches long, is bolted to a slat. These angles engage the wheels of the truck so that it can be carried up the incline. The trucker rides on the slat platform.

The second week after this conveyor was put in operation, the bolts which held the slats (the slats, the 2 x 3 angles were bolted on) to the chain started to bend, and, in some instances, to break. New bolts were used, but the same trouble was experienced; in fact, the new bolts did not last longer than a day. After these bolts had been replaced three or four times and the trouble was not remedied, it became necessary to investigate more thoroughly because the conveyor was a great help to operation, but with the difficulty present, could not be depended upon as it usually broke under load.

By studying this problem, the master mechanic found that a very important point had been overlooked in construction. The wooden slats, which are three inches wide and one and a quarter inches thick, rested on a projection on the side of the chain. This projection or attachment is about two inches long and one and a half inches wide with a hole in it which permits the slat to be bolted to the chain as shown in the upper left hand corner of the enclosed sketch. It will be noted that the weight of the truck was applied to the 2 x 3 angle at point "A" and transmitted in the direction of point "B." The wooden slat had such a small surface that the metal chain attachment cut into the wood, as shown in the upper right hand corner of the sketch, slowly bending the bolts until they broke. The new bolts bent and broke quickly because the wood was already dented and the full load was applied direct to the bolt.

The difficulty was solved very easily. We obtained pieces of bar stock, ⅜ of an inch thick by 2 inches wide by 3 inches long and drilled a hole in the middle of each piece. Next, we cut out the under side of the wooden slat at each end so as to allow one of the pieces to fit in flush, then we placed a piece on top of the slat at each end and bolted the assembled slat to the chain, as shown in the two lower views of the sketch. This gave a bearing surface of metal against metal and as there was no give the bolts were held in an upright position, and no bending or breaking occurred. This conveyor is now a successful installation, but the lack of attention to detail in construction nearly made it an unsuccessful installation.



Question No. 23. Overcoming break downs on a ramp conveyor.

* * *

Comment.

The above letter is interesting and greatly appreciated by the conductor of this column. It shows very thoroughly the importance of proper construction. No doubt many other readers have experienced similar difficulty with one of the many types of machines which are now used for handling materials. The Forum will be pleased to publish these for the benefit of all readers, thus dispensing knowledge which will be of use to many.

* * *

Question No. 1, published in the Forum for January, 1925, asked the readers for their experience in handling bulk acid phosphate. We have received a number of letters covering this subject and have started to check up the information given. So far we have three distinct types recommended and will undoubtedly publish a recapitulation of the data within the next two months.

* * *

Question No. 32.

We are planning to use tractors and trailers for hauling materials between departments. Can you tell us the best type of runway to lay in order to make for efficient operation?

* * *

Answer.

Many points are raised as to the best type of roadbed to be used for tractors and trailers, and many arguments have been presented in favor of various materials. For this reason, the following table of tractive resistance of various surfaces is presented. It is checked with two or three well known authorities.

Type of road surface	Resistance Pounds per Ton
Brick, smooth	40
Cement, floor	40
Granite blocks	56
Wood Blocks	40
Gravel Road	75
Clay	200
Pure Concrete	53
Wood Planking	43
Wood Planking, sticky surface	57

Thus it will be seen that the three main types of roadways, brick, cement, wood blocks, are about equal. As much depends on the constant maintenance attention given to the "right-of-way" it is difficult to make a definite recommendation as to the best type of surface. One large user of tractors found that a concrete floor was badly worn by the tractors and trailers, so he covered it with asphalt about 1½ inches deep. In two years of heavy hauling this asphalt has shown very little effect of wear while concrete under the same conditions had cracked and developed holes. However, slightly more power was required to pull a load on the asphalt flooring.

* * *

Question No. 28.

Has the Materials Handling Forum or the editorial office of Industry Illustrated any information as to what factors cause the greatest amount of wear on factory floors? We are very anxious to find out.

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We have considered the following factors but do not know their relative proportion of wear.

(a) steel wheels on trucks
(b) steel feet on lift truck platforms or skids
(c) vibration of machinery
(d) oil dripping
(e) general foot traffic, etc.

* * *

COMMENT.

The evidence obtainable from personal observation seems to indicate that more damage is done to factory floors by improper installation methods than by the equipment run over them, also lack of proper maintenance to small defects quickly deteriorates the entire floor.

As the two questions, 28 and 32, apply to flooring, it seems to indicate a desire for more specific information. The only way to obtain this information is to apply to practical users, such as the readers of the Forum. We would, therefore, like to receive some letters giving specific data on the above questions stating what our readers consider as a paramount factor in causing floors to wear.

What Management and Machinery Have Done for Labor

(*Continued from page* 31)

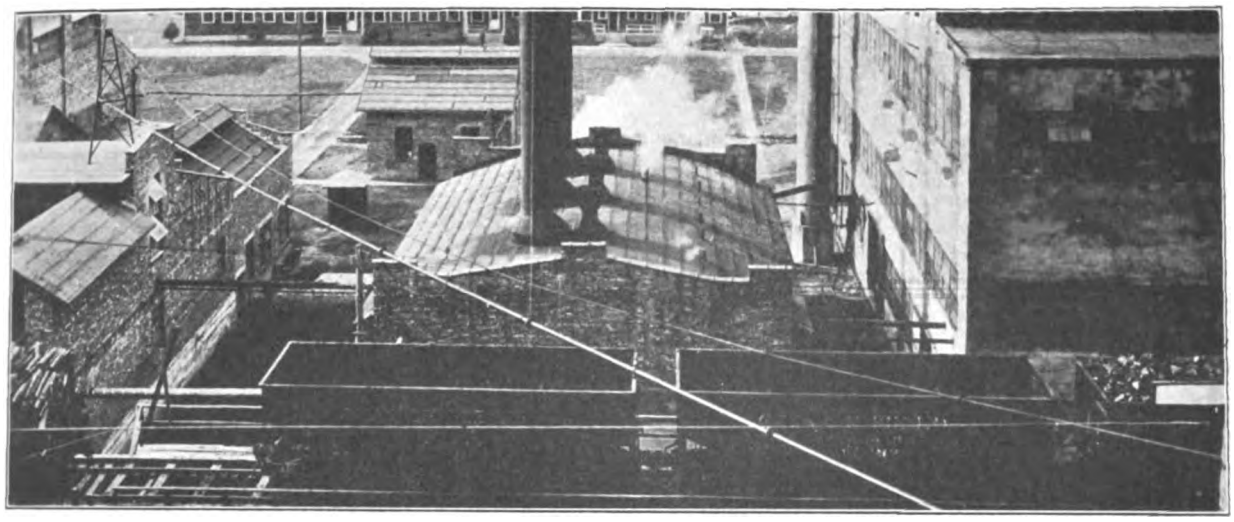
relative skill of wage earners if one industry be compared with another, the price level if several years are being compared and, presumably, by the length of the working day.

Presumably, a longer day would mean more products, or what is the same thing, a greater value added per wage earner. Apparently, however, the shortening of the hours of labor has not had such effect. I have made the comparison within a given industry and have made allowance for changes in price level. The factor of skill is eliminated if the comparison is made within a given industry over a series of years. The factor of efficiency in the management of men and capital cannot be measured quantitatively, so that the apparent gains in the efficiency of the wage earners may be due, partly at least, to this factor. The results are interesting despite this defect.

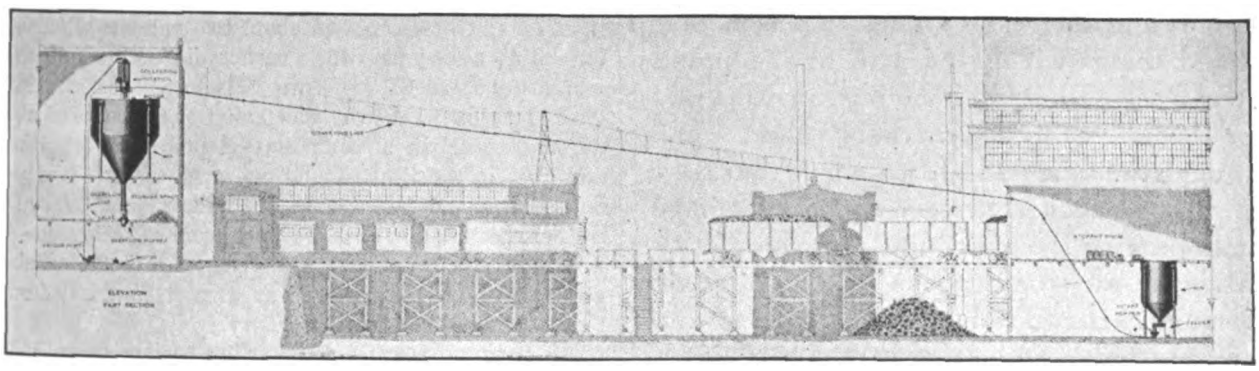
The salient points in the cotton goods industry are: an increase of over 100 times as many workers in the 8-hour group and a great decrease in the 10-hour group; that is, a considerable shortening (Fig. 2) of the hours of labor in this industry. Prices in 1919 are about two and one-half times prices in 1914, yet value added per

(*Continued on page* 38)

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(*Continued from page* 36)

wage earner is a little more than three times as great. The factor of skill of the worker does not need to be considered as we are comparing two censuses within the same industry. The change in price level is taken into account; the change in hours of labor are taken into account. The unmeasurable factor of management remains. Yet 1919 is admittedly a year of less efficiency for both workers and managers than 1914. A shortening of hours of labor in this industry has resulted in a greater value added per wage earner. The cotton goods industry ranks second among manufacturing industries in total number of wage earners employed, the average number of wage earners at the three censuses being 407,463.

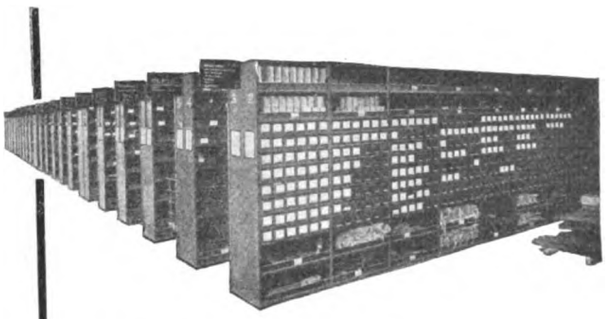
In iron and steel (Fig. 3) prices have nearly doubled between 1914 and 1919, yet value added per wage earner in 1919 is two and one-third times as great as in 1914. The increase in proportion of 8-hour day workers is from 8.0% in 1914 to 31.8% in 1919. Thus the decided shortening of the average day has a stimulating effect upon value of production, even when prices are taken into account.

In the clothing (men's and women's combined) industry (Fig. 7) the proportion of workers in the 8-hour or less group increased from 13.7% in 1914 to 90.0% in 1919. Prices increased about two and one-half times, but value added per wage earner did not quite double, increasing from $1,604.30 in 1914 to $3,183.66 in 1919. This is a case where the shortening of the hours of labor did not result in an increase (if prices are taken into account) in the value added per wage earner. It is perhaps due to the fact that in this industry in 1919, by far the greatest number of workers were in the group—44 hours or less per week. The change in hours of labor from 1914 to 1919 were far greater in this industry than in any other large industry.

Shortening of hours of labor has been accompanied by increases in value added, greater than price increases in the case of cotton goods and iron and steel. In the printing and publishing industry, where from 70 to 90 per cent. of the total employees have worked eight hours per day or less, the value added per wage earner has been highest; while in lumber and timber products, where from 60 to 85 per cent. of the total employees have worked ten hours or more per day, value added per wage earner has been almost the lowest among large industries.

The capital employed per wage earner for the different industries is unfortunately not available. Whether the increases in value added for cotton goods and iron and steel coincident with the shortening of hours, are due to increased ability in management, increased efficiency of new machinery, or greater intensity of exertion by wage earners during a shorter day cannot be decided. Ability in management is difficult to measure except by results; capital expended for new machinery is not recorded. Perhaps all of these factors share in the increased value added by manufacture.

Even though the positive statement may not be made, at least the negative one may. That is, the shortening of hours has not been accompanied by a falling off in the value added by manufacture. Furthermore, high value added per wage earner is not associated with long hours; nor are short hours associated with low value added per wage earner.



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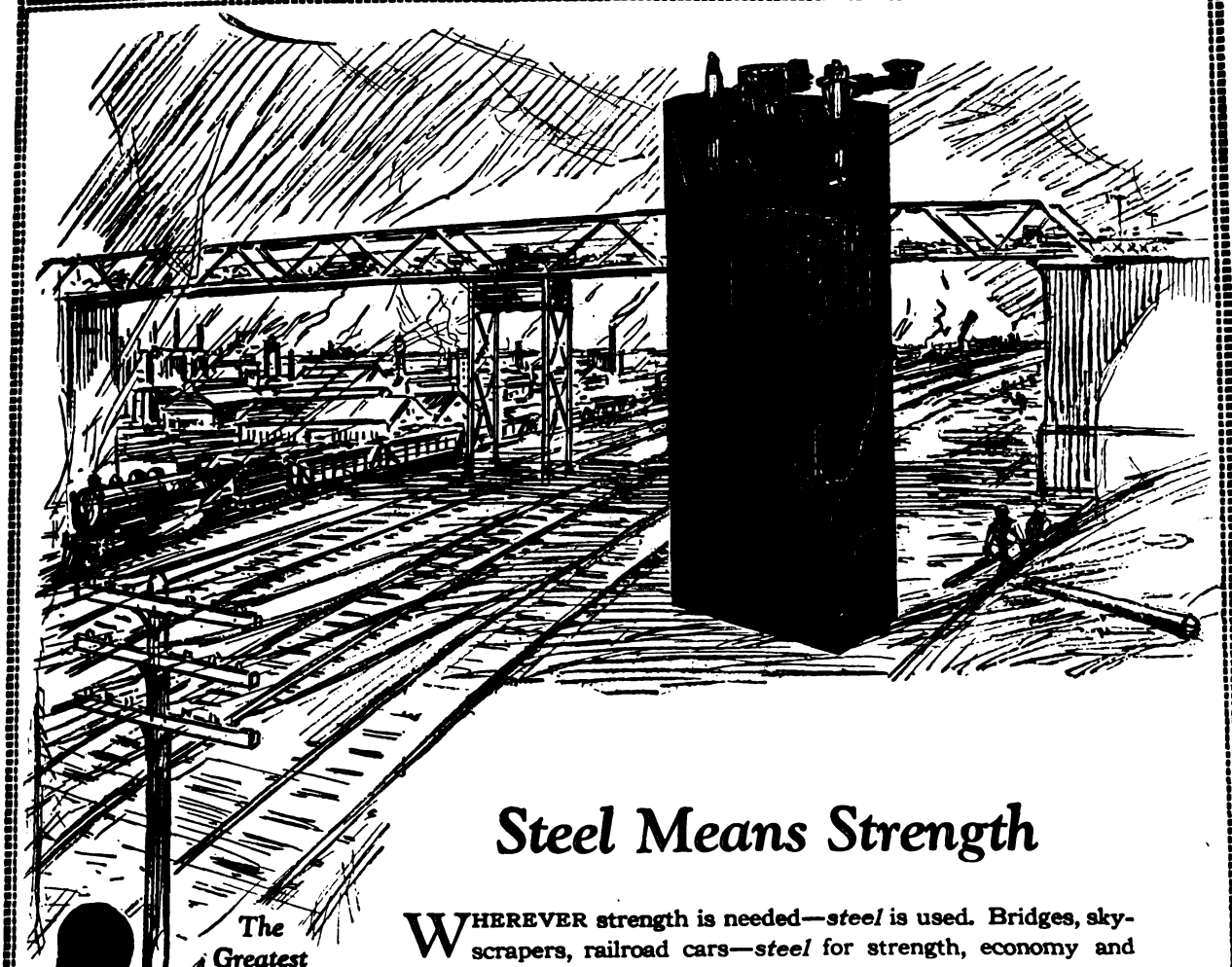
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Mechanical Handling Blazing New Trails

(*Continued from page 29*)

1,200 pounds can be loaded with this method, in three minutes. After the correct weight is placed in the bucket, the electric truck transports it from fifty to one hundred and fifty feet, depending on the point of loading, to the location shown in Fig. 3, where the live skid and charging bucket is deposited ready for the telpher operator to transport the load direct to the cupola.

Coke and other bulk material is stored directly under the telpher runway, thus eliminating the necessity of an additional transfer. The method of loading the coke to buckets, using one man with a pitchfork, is shown in Fig. 4.

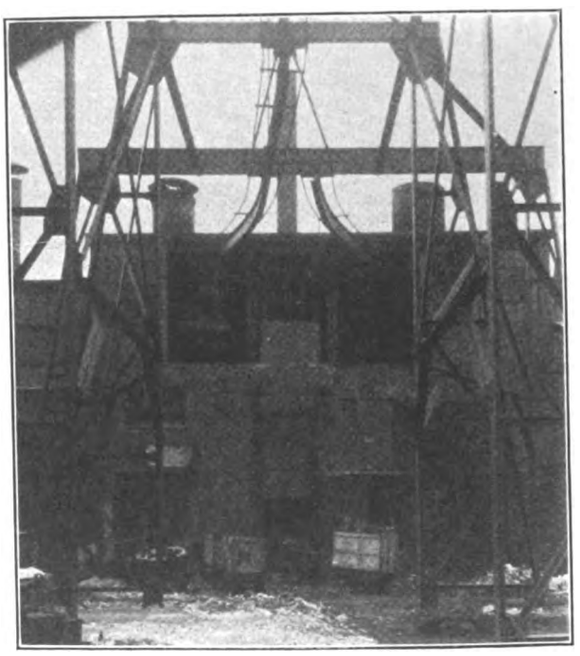


Fig. 9. View showing old and new method of cupola charging and the approach to both cupolas. The track switch can be swung by the operator of the hoist without leaving the cab. This permits entrance to the charging platform of either cupola.

It must be remembered in using this equipment that the location of the raw materials storage yard would alter materially the layout, but the same principle of transportation can be applied in many plants.

Those acquainted with foundry practice are familiar with the sight of men throwing the various materials into the cupola, and while this occupation is good and warm during the winter months, it is rather difficult during the hot, summer months, and frequently is a source of labor difficulty. Imagine, therefore, the advantages obtained by using this mechanical equipment where the man charging the cupola is never within eight feet of the opening and always fully protected. Fig. 5 shows how the nose of the crane projects the bucket directly to the center of the cupola before dropping the charge. After the charge is dumped the bucket is withdrawn, and when lowered to the ground is automatically closed and locked.

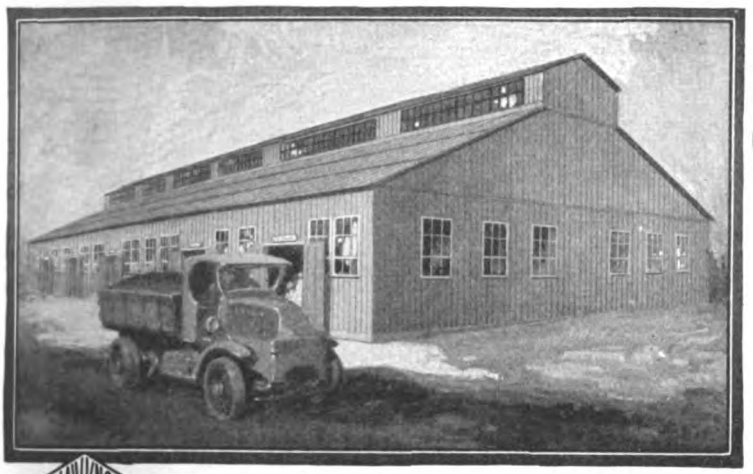
The bucket shown in Fig. 7 is known as an umbrella

(*Continued on page 45*)

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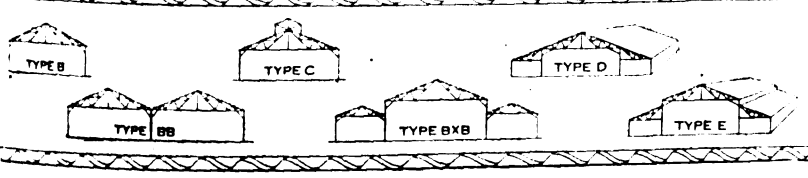
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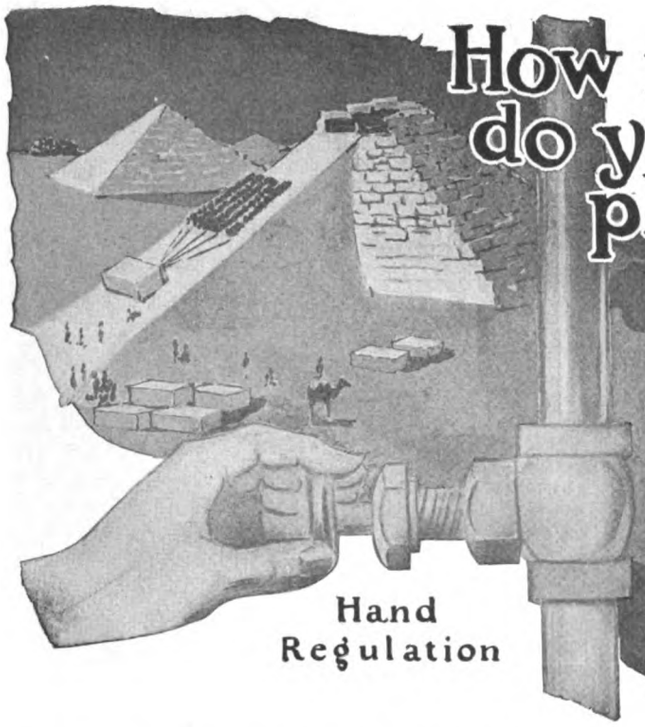
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How many Pyramids do you build in your plant every day?



Hand Regulation



Tycos Automatic Temperature Controls

If a modern contractor built the pyramids today—

He would not use swarthy brown perspiring laborers to haul the huge stones up a dirt incline. Labor was cheap then—

Of course he'd use a modern hoist and run it either by electricity or steam. Labor is expensive today.

If you build or re-equip a modern factory today you want to know the better methods of temperature and pressure control. Knowing this turns the red ledger figures into black. That is, in so far as steam, labor and temperature uniformity are concerned.

To know *Tycos* Automatic Controls just glance through *Tycos* Catalogs. *Tycos* Catalogs are written for many specific industries. Signify your interests and the right catalog will be mailed you.

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INDICATING · RECORDING · CONTROLLING

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(*Continued from page* 40)

type because of its bottom dump which spreads the material.

While the bottom drop bucket, shown in Fig. 6, is used in this installation for handling coke and the umbrella type, shown in Fig. 7, is used for the handling of metal, there is likely to be a difference of opinion among foundry men, to such an extent that these types would be reversed; that is, the umbrella type used for coke and the drop bottom type for metal. This difference of opinion is due to the different practices in cupola charging; some operators like to have the metal near the center and others like to have it near the edge of the cupola. As the buckets are really an accessory, they can be built to conform to the various foundry requirements and cupola capacities.

The particular installation being described consists of a straight run of track and a two way switch, all of which is clearly illustrated in Figs. 8 and 9. Fig. 8 is taken looking away from the cupola charging floor and Fig. 9 is taken looking toward the cupola charging floor.

This method of cupola charging has only recently been put in practice, but immediately upon the equipment taking over the handling job, it was possible to release two men from the stock pile for more productive work. It is estimated that the mechanical equipment will further conserve labor to the extent that the complete cupola charging force under full capacity will consist of not more than three men and possibly only two men. In addition, during the rush season, much more efficient and quicker charging can be accomplished and considerable time saved. It is also estimated that the complete cost for equipment and installation will be saved in approximately two years.

Every industrial plant is faced with the problem of properly using what is known as common labor for the reason that the wage rate per hour of this class of labor has increased materially in the last fifteen years. While common labor could be obtained for $1.00 per ten-hour day in 1910, the same labor is now obtaining on the average of $3.84 per eight-hour day. By comparing these figures, it will be noted that one man in 1925 actually costs more than three men in 1910. In addition to the monetary value of labor there is a need of properly using every individual workman to the utmost advantage, and there is no better way to accomplish this to the benefit of all than by properly applying some form of mechanical equipment for the handling of material. Using the figures in this paragraph and multiplying them by the figures in the preceding paragraph we are able to obtain an approximate money savings effected by the installation of this cupola charger. When we consider the other advantages it is not difficult to realize the economic value of such equipment.

It is safe to say that there are many handling problems throughout various industries that could be accomplished better mechanically than with the present hand methods, but the difficulty is to find these problems. This finding of the problem cannot always be done by the materials handling manufacturers and it is therefore advisable for the industrial executives to investigate every handling operation, and even though some seem to be impossible to solve mechanically, they should be submitted to various manufacturers for consideration.

Common Sense about buying Exhaust Fans

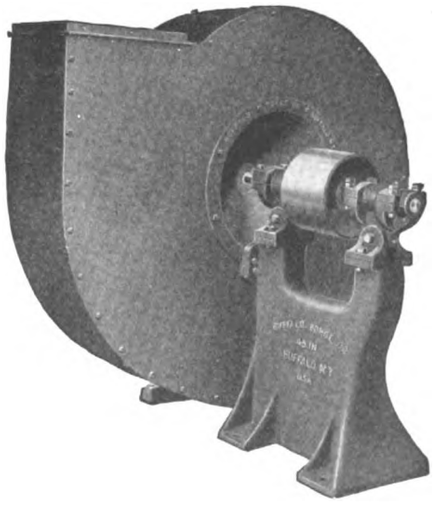
We make two types of mill exhausters.

The Buffalo Standard Planing Mill Exhauster is a substantial, balanced, properly designed fan, with a good efficiency. No fan for mill exhaust work is any better than the Buffalo "Standard" EXCEPT:

The Buffalo High Efficiency Slow Speed Mill Exhauster

This is an entirely different fan, larger and of different design. We do not merely use the next larger size Standard fan; but use a different wheel, different housing and change the inlet and outlet dimensions. This enables slow speed operation, with very high efficiency. Reduced maintenance costs, and much lower power consumption are important advantages found in no other fan.

The difference in horsepower required, alone, (in some cases as high as 50% saving) makes the Buffalo Slow Speed the most economical to buy, as the difference in first cost is not great.



We supply these outfits for belt or motor drive, over a complete range of sizes. Let our Engineering Dept. recommend the proper fan for your plant.

Buffalo Forge Company
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There is no time wasted —no unnecessary work—no danger of wrong adjustment by inexperienced help with the new No. 9 Sarco Steam Trap. It is ready for business as soon as you screw it into the pipe line. It works perfectly at any pressure between 0 and 100 lbs.

Large valve area and quick lift when discharging give the Sarco unusually large capacity. And it closes just as promptly, preventing escape of live steam.

Has only one moving part—nothing to get out of order. The seamless bronze multiflex bellows, which distributes the wear over the entire number of corrugations, makes this part almost wear-proof.

But the most surprising thing about the Sarco is that it costs about two-thirds less than most traps.

Why not try a Sarco for thirty days without cost? We will take it back and thank you for giving it a trial if not entirely satisfied.

Mail the coupon below for Booklet R-254, and full particulars.

SARCO CO., Inc.

236 Broadway, New York City

Boston Chicago Detroit Buffalo Cleveland Philadelphia
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SARCO STEAM TRAP

Sarco Co., Inc., 236 Broadway, New York City.

Please send Booklet R-254 and full information and prices on the new No. 9 Sarco Steam Traps checked

☐ Size..... Pressure..... ☐ Size..... Pressure.....

Firm .....

By ..... State.....

City.....

Have You a Painting Program?

(*Continued from page* 16)

ment by the sudden realization that costly repairs are necessary. This is *not* the way to care for this important detail of plant management. The maintenance of both plant and equipment should be placed squarely up to one individual, no matter what his title may be, and then he should be held responsible for its care.

Periodic Inspections

The only way to make sure that no important surface is being overlooked is to make it a standing rule to inspect carefully all parts of the plant and equipment, inside and outside, at least twice each year. The best time to do this is at the beginning of spring and the beginning of fall. The effects of a severe winter season are frequently reflected in rusted metal surfaces and cracked and worn wood surfaces. The latter condition is especially prevalent in the condition of the houses owned by the company, in which employees live. Where villages are owned by the company, there should be a definite period between paintings, governed of course by the manner in which the previous paint coat has worn out and protected the surface. Generally, if the right quality of material is used, a three year painting period will insure the property being kept in good condition. Some companies follow the rule of painting one-third of the village every year. In this way, every house is given attention, and there is no heavy investment required for any one year to keep the property in shape.

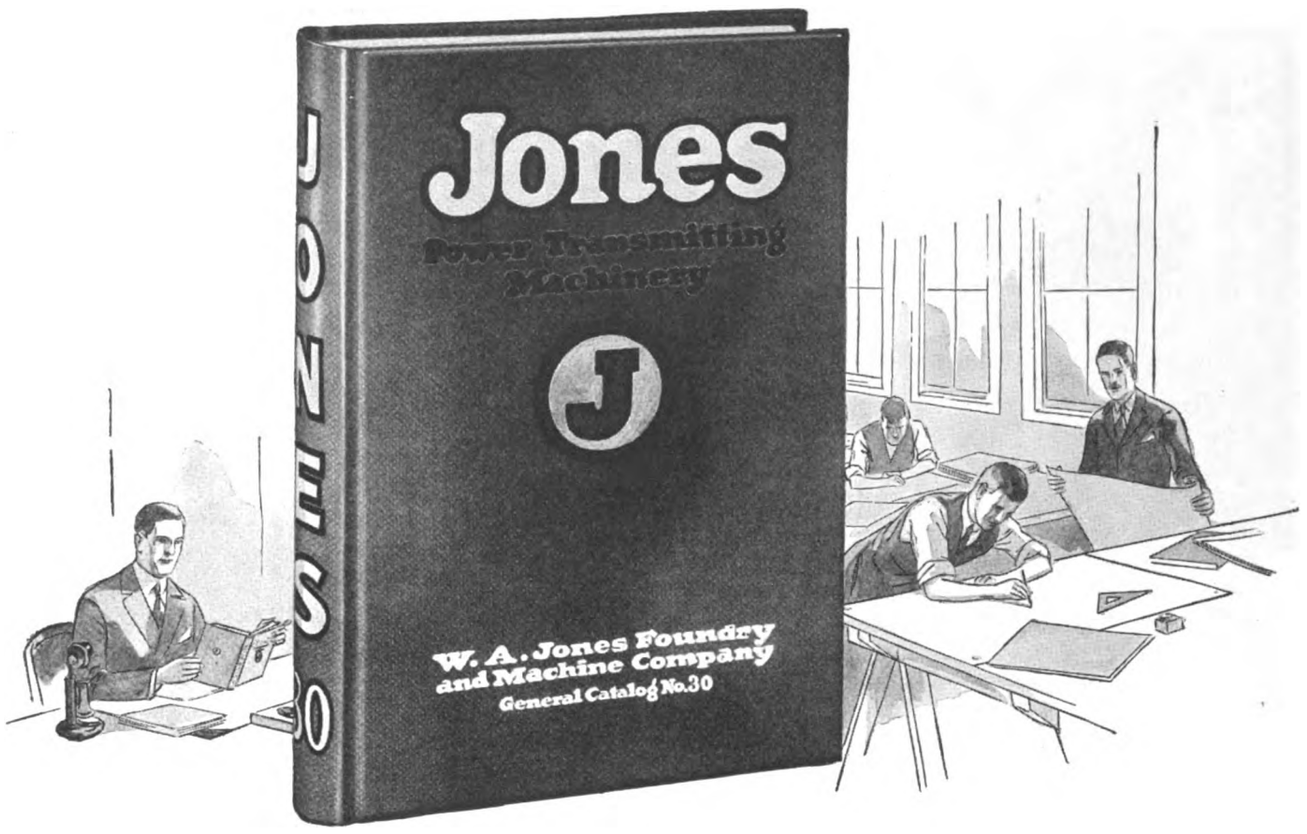
As far as the plant is concerned, at the spring and fall inspection periods, the individual in charge of maintenance work should take a pad and pencil and make a record of all the surfaces which show signs of wear and deterioration. It is the neglect to take care of these surfaces, even though notice may be taken of them, that is responsible for enormous yearly losses and consequent replacement of parts. Naturally, the surfaces showing the greatest need for protection should be given preferred attention, and let the others follow as promptly as possible.

After deciding upon the painting program, there are two very important details still to be taken care of,—namely, the choice of materials to use and the manner in which they shall be applied. In the case of the first problem, unless one has made a thorough study of the subject, it is best in the long run to place the matter in the hands of a responsible paint and varnish manufacturer and let him prescribe for each surface. He is in a position to *know* the type of material to use to wear best and produce the most satisfactory results. This takes the matter out of "guess-work,"—frequently the cause of heavy expense and unsatisfactory results.

In the case of the application of the material, most concerns of average size have at least one man, possibly several, whose duty it is either to do the work himself or oversee others who are employed to apply the paint or varnish, as the case may be. These men are usually skilled in methods of application, in proper surface preparation and other important details incident to successful paint application. Too much stress cannot be laid upon the necessity for adequate supervision in all painting work. For instance, in the case of a badly rusted pipe or other metal surface, unless the rust and corrosion is

(*Continued on page* 48)

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A 24 Ounce Library on Power Transmission

A Partial List of Contents

Illustrations, data, diagrams and tables on gears and pulleys of every type and size, on hangers, pillow blocks and flexible couplings. Friction clutches, compression couplings, etc., etc. Speed reducing equipment, spur gear speed reducers, enclosed worm gear drives are illustrated, diagramed and tabulated. We doubt whether any other book contains as much authoritative data on power transmission.

This 448 page book is less than an inch thick. It is the last word—a handy ready-reference library on the transmission of power. It is the latest—just off the press.

It shows a wide variety of appliances for power transmitting, with usable information about each type of equipment. The many diagrams and tables are practical and easy to understand.

Every engineer, manufacturer, purchasing agent and plant executive should have a copy of this handy, compact, thoroughly indexed book. In it are expressed over 34 years of specialized experience in the power appliance field.

It is free. Send for your copy today on your business letterhead.

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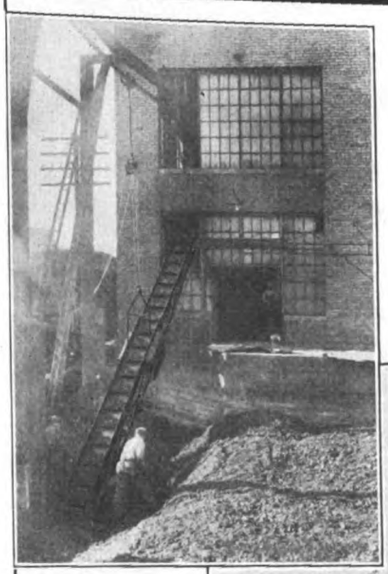
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Power Transmitting Machinery

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Drag Conveyor loading coal into boiler room.



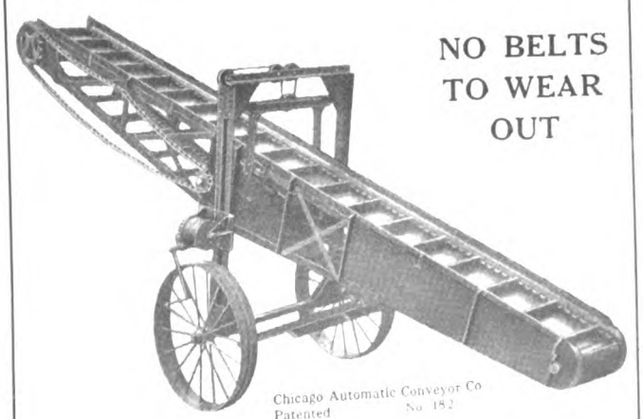
Conveyor on trolley unloading coal from car over wall into storage pile.

Simplify your Materials Handling

You will find Chicago Automatic Conveyors used on hundreds of handling tasks. Many applications, the above of which are a few examples, are shown in our illustrated catalog.

These conveyors are made in belt and bucket type and they will simplify your handling problems. Built all steel and last ten years or more.

Order one or more now and start saving labor costs.



NO BELTS TO WEAR OUT

Chicago Automatic Conveyor Co.
982 Old Colony Bldg.
Chicago Ill.

(*Continued from page* 46)

removed by wire brushing, scraping or other methods, the surface made clean and in proper condition for painting, the value of the paint coat, no matter what its character, will be greatly minimized. In fact, the rust will proceed underneath the paint coat, just as though it wasn't there. So, the first duty of the maintenance engineer is to see that all surfaces are put in proper shape for painting. Then see that the material is correctly prepared for use; that the directions of the manufacturer are followed, as far as reduction of the material to take care of surface conditions is concerned. Then see that plenty of time is allowed for all coats to dry properly before following coats are applied. In other words, the price to pay for successful painting is *everlasting vigilance*.

The results of the failure to have a set maintenance program are clearly shown in Fig. 3. Note how the small amount spent for paint and varnish is reflected in a heavy rise of the depreciation line, which, while not clearly visible, is nevertheless real. In Fig. 4, a company having a set maintenance program, embodying painting every three years, keeps its depreciation down to a minimum. It is plainly evident that the money spent for painting is therefore not an expense, because it returns large dividends in decreased depreciation and lengthened life of plant and equipment.

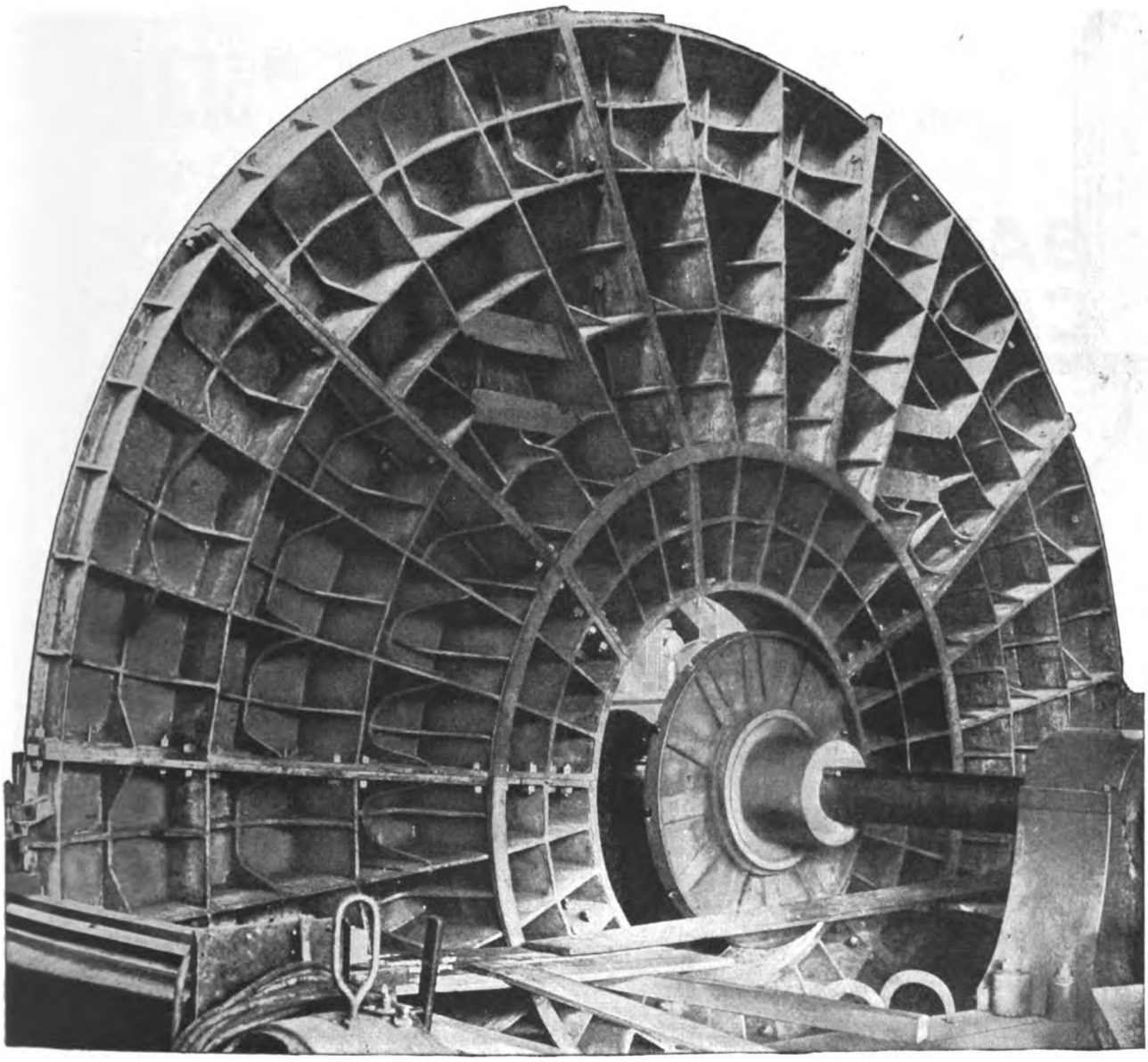
In applying this principle to the upkeep of equipment, the manner in which this is done depends largely upon the nature of equipment used. A certain factory had been in the habit of replacing a very expensive valve in its water line about every year, due to the destruction of the valve from rust. It was placed under very disadvantageous conditions, subject to extremes of moisture and dampness, which greatly shortened its life. While going through the plant, the superintendent called attention to the fact that he had been in the habit of buying a new valve for this location about every year or so, as each rusted out in about that time. He was asked, "Why don't you paint it?" He said that he didn't think it possible to find a paint that would stand up under these conditions, and that in fact he had never thought about painting it. When convinced that a coat of the right paint applied every six months would prolong its life indefinitely, he was amazed that he had not thought about it before. He could see where he could save his company a great deal of money in the long run, as there were still other valves and pipes in the plant in exactly the same condition.

The Price of Neglect

How much money is lost to the manufacturing concerns in this country through neglect to take proper care of plant and equipment is extremely hard to estimate; but it runs into the millions of dollars. It seems strange that a manufacturing plant constructed at the cost of thousands of dollars, and which to show a profit must function somewhere near 100%, should not be considered valuable enough to have adequate provision made for its care. Yet in American industry today one could find thousands of plants where, to all intents and purposes, there is no plan provided for a regular, annual or semi-annual inspection, with provision made to follow this inspection with the use of paint and varnish where needed. The Dutch once had a saying that good paint

(*Continued on page* 52)

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83,000 Pounds

Dodge is an organization equipped by experience, facilities and service to supply the regular and special needs of industry.

Hundreds of Jobs Like This Are Built by Dodge

This plate glass polishing table, 25 feet in diameter, weighing 83,000 pounds was cast in the Dodge foundry and is being machined in one of the big pit lathes in the Dodge shops at Mishawaka.

This table is a small part of a plate glass polishing and grinding machine which was built complete by Dodge.

The extensive engineering, foundry and machine shop facilities of the Dodge organization are available to all industry for the production of special heavy equipment.

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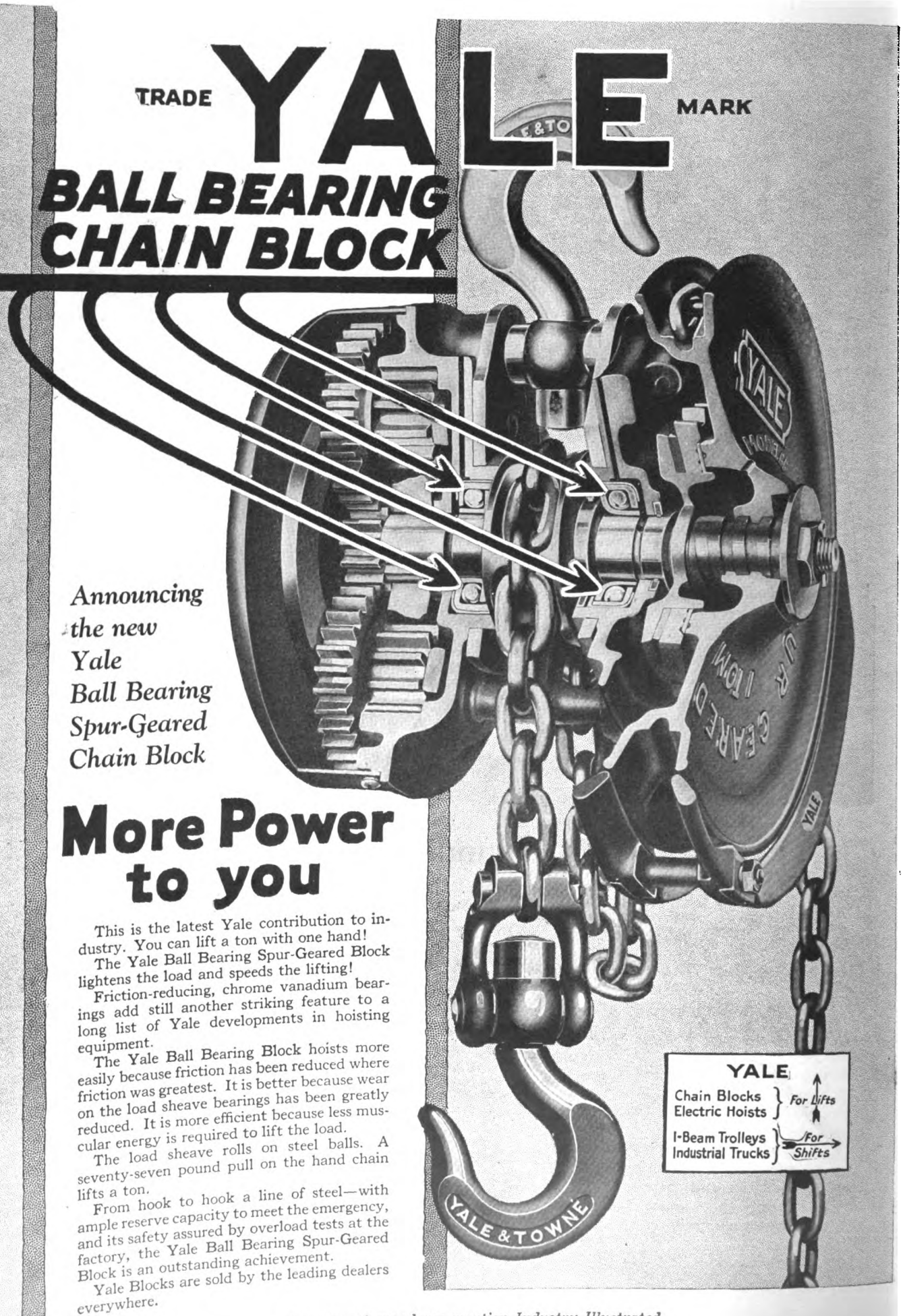
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BALL BEARING CHAIN BLOCK



Announcing the new Yale Ball Bearing Spur-Geared Chain Block

More Power to you

This is the latest Yale contribution to industry. You can lift a ton with one hand!

The Yale Ball Bearing Spur-Geared Block lightens the load and speeds the lifting!

Friction-reducing, chrome vanadium bearings add still another striking feature to a long list of Yale developments in hoisting equipment.

The Yale Ball Bearing Block hoists more easily because friction has been reduced where friction was greatest. It is better because wear on the load sheave bearings has been greatly reduced. It is more efficient because less muscular energy is required to lift the load.

The load sheave rolls on steel balls. A seventy-seven pound pull on the hand chain lifts a ton.

From hook to hook a line of steel—with ample reserve capacity to meet the emergency, and its safety assured by overload tests at the factory, the Yale Ball Bearing Spur-Geared Block is an outstanding achievement.

Yale Blocks are sold by the leading dealers everywhere.

YALE
Chain Blocks, Electric Hoists — For Lifts
I-Beam Trolleys, Industrial Trucks — For Shifts

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10 Vital Points for Greater Service

The Yale Ball-Bearing Block and Roller-Bearing Trolley

1 Steel Roller Bearings
Eight hardened and ground roller bearings support the four trolley wheels for easy lateral motion.

2 Steel Side Plates
The wrought steel-plate suspension members, extended to protect the wheel flanges, are connected at a central pivotal point by the equalizing pin.

3 Steel Equalizing Pin
A cold-rolled pin, supporting the suspension clevis, or top hook, connects the side plates, allows for adjustment in width of I-Beam and permits flexibility on track irregularities or short curves.

4 Steel Safety Hook and Crosshead
Heavy steel forgings designed to withstand shock and surge loads of several times their rated capacity. These permit free swiveling and rocking action.

5 Steel Suspension Plates
Heavy wrought steel suspension plates connect the upper hook with the ball bearings on which the load sheave rotates.

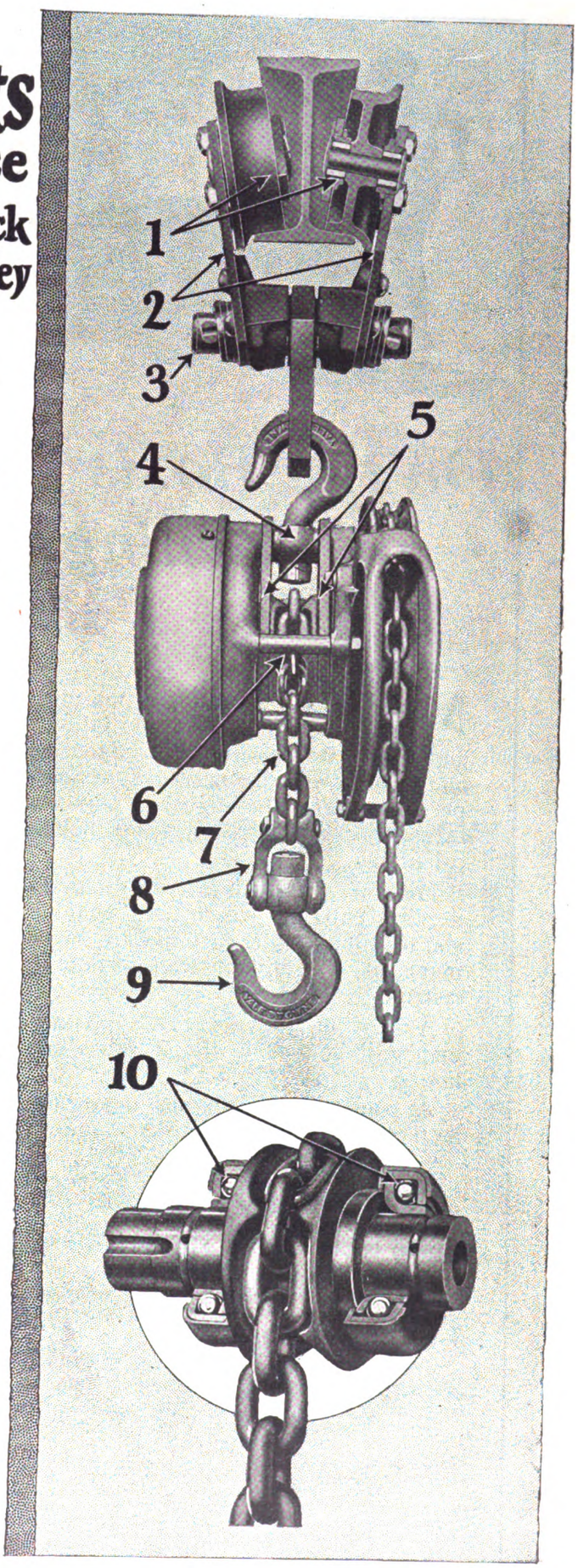
6 Steel Load Sheave
A massive one piece load sheave, ground on an arbor to give perfect concentricity for the ball races and mounted on bearings, each carrying eighteen chrome vanadium steel balls.

7 Steel Load Chain
Each link die-formed to perfect uniformity, electrically welded on the side, heat treated and gauged. Every link tested to three times its rated capacity before assembly in the block.

8 Steel Detachable Shackle
Simple to connect by means of the steel heat treated oval pin and stronger than the chain itself. This Yale feature avoids the necessity of hand welding when attaching the hook.

9 Steel Safety Hook
The "safety valve" of the Yale Block. Drop forged from special steel, it opens slowly, without fracture, before any other part of the block is overstressed—protecting the block, the load and workman.

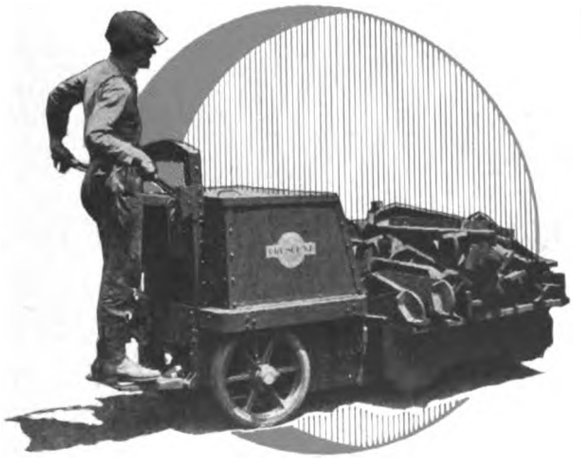
10 Steel Ball Bearings
Large chrome vanadium steel ball bearings surrounding the massive steel load sheave, reduce friction and make the Yale Ball Bearing Spur-Geared Chain Block more efficient, easier in operation, more lasting in service. A better block has never been made.



The Yale & Towne Mfg. Co.
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On the Basis of Earnings

It Pays to Crescentize

MATERIALS handling is nothing more or less than transportation and as such its cost can well be figured *a la* railroad—on the basis of so much per ton mile. That figure is fundamental. From it earnings are to be calculated.

Here are the basic facts in relation to Crescentizing which will enable you to calculate the earnings (or savings) of your plant transportation system.

A Crescent Electric Truck with one man will haul 4000 lbs., 6 miles an hour.

A hand truck with one man can haul at best 500 lbs., 1⅛ miles an hour.

Without going into the mathematics of the thing it will be seen that the services of 7 more or less high priced workmen are made available for other purposes; eight times more tonnage is hauled and the speed increased five times.

Crescent Trucks will handle most anything anywhere—indoors or out and show actual earnings on the investment.

We'll be glad to consult with you and show the earnings to be made with Crescent Trucks over other methods of plant transportation.

CRESCENT TRUCK CO.
165 North 10th St.
LEBANON PA.

(*Continued from page* 48)

costs nothing. This was never more true than in connection with American manufacturing plants, where its liberal use pays big dividends, seen and unseen.

In providing for the proper protection of plant and equipment, one should not overlook the value of color. Much could be done toward adding to the attractiveness of the appearance of industrial plants, without detracting one whit from the value of the paint from the preservation standpoint. For instance, the use of yellow of a bright shade on electric trucks would render them highly visible and at the same time give them adequate protection from the elements. Yellow is already used by many concerns as an identifying color for fire equipment because of its high visibility. In most cases color is secondary to the more important consideration of the character of the product that will best meet the exact needs of the surface and the conditions under which the paint must serve. Furthermore, it is possible in most instances to choose from a number of shades, any one of which would meet the need from the standpoint of make-up of the material. So that the maintenance engineer in thinking about the necessity of proper protection need not overlook the possibility of selecting the paint from the appearance viewpoint as well.

Unit Heaters in Industrial Buildings

(*Continued from page* 25)

to operate the fan except in the warming up period in the morning and again in the late afternoon. During the middle of the day enough heat is generated without operating the fan, due to the aspirating effect obtained. This is especially true of the vertical units. Where direct radiation is used the steam is usually turned on in the morning and left on all day. If a department gets overheated the usual procedure is to open the windows instead of closing off the radiation. With a unit heater it is different—it being so easy to stop the motor when the temperature rises. When automatic control is desired, it is less costly to install on unit heaters than on direct radiation—either by regulating the steam flow through the coils or by controlling the operation of the fan.

Occasionally, when floor space is especially valuable, the units are suspended from roof trusses or building columns. Where this is done it is necessary to overheat the upper portion of the building in order to properly heat the working level. This is always the case when the heating surface is placed high above the floor, thereby increasing the fuel consumption from 10% to 50%. It would seem that the best location is to have the units stand on the floor or at least with the discharge outlets not over 10 or 12 feet above the floor and arranged to direct the warm air into the working areas.

The heating surface may be of pipe coil, or one of several patented types. For high pressure work, pipe coil is required, but for low pressure (under twenty lbs.) one of the patented materials sometimes is of advantage as being lighter, which is important where units are suspended from roof trusses or columns.

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Another case of ordering it practically from stock

You have places in your shop where you need a quicker lifting crane or where you cannot lift as high as you wish on account of the low roof.

Yet you don't want to invest too much money.

Here is where our

Standardized LINE OF CRANES

comes to the front.

They are built in quantities for just such a case, giving you a higher lift without raising the roof.

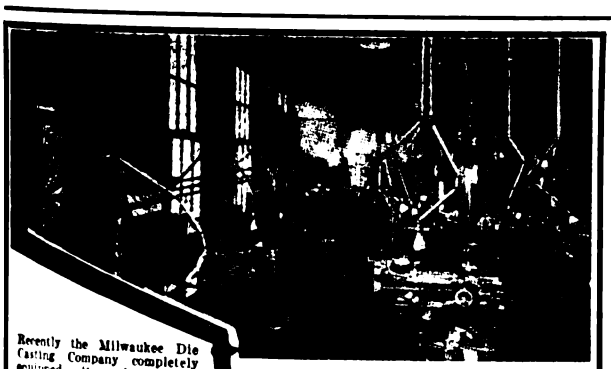
No superior crane can be designed or built.

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Recently the Milwaukee Die Casting Company completely equipped its plant with "American" Adjustable Fixtures with conduit fittings.

Proper Lighting Eliminates Accidents

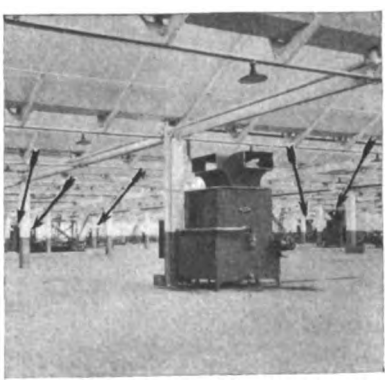
These are the statistics of a large insurance company—18% of industrial accidents caused by poor illumination.

American Fixtures are carefully designed to meet the most exacting demands of the shop where concentrated light is required. The scientific arrangement, however, eliminates the glare to the eyes—and throws sufficient illumination on the work by the proper direction of the light rays. The light is steady—sharp shadows are avoided—there is steady diffusion.

A complete illustrated catalogue fully treating the value of good lighting will be mailed free. Write for it.

American Fixture Company
230 West Water Street
MILWAUKEE WISCONSIN

ENGINEERED YORK PRODUCTS



ATWATER KENT HAS 38 YORK UNIT HEATERS

When the first section of the new modern radio plant of the Atwater Kent Mfg. Co., Philadelphia, was completed, two York Unit Heaters and three of a competitor were purchased and tried out for one whole heating season. Twenty York Units were then ordered for the remainder of the plant, and recently sixteen more were ordered for an addition.

What more need we say, other than to remind you that Atwater Kent would hardly re-order twice, for a total of 38 units, if they were not completely satisfied.

You Won't Find These in Every Unit Heater

1—Full housed, ball bearing, multivane fan; 2—Welded pipe coils which mean no leaks or maintenance; 3—Operates equally well on vacuum, low or high pressure steam.

Write to the YORK HEATING AND VENTILATING CORP., 1500 Locust Street, Philadelphia, for catalog and for facts regarding comparative heating costs, and the economy of mounting units on the floor. No obligation.

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"Six men formerly handled them one at a time. Now two men handle fifteen at once with the crane."

IT'S a great story of saving the Mead-Morrison Mfg. Co., of East Boston, tells—a saving in money, time and man power.

Take the matter of unloading gear blanks alone. When the work was done by hand, six men were required—three on the ground and three in the car. Only one blank could be handled at a time.

With the Baker 3-way Crane, two men are all that are necessary, and they take fifteen blanks to a load, swinging them from gondola to storage with one movement of the crane. Yet this is only *one* of its many uses. The crane is in service on heavy work all day long—placing gears and shafts in the press, lifting 4300-lb. coal buckets, handling differential gears.

If you have a similar problem, it will pay you to investigate this machine. Some one of the other Baker models may serve your requirements even better.

Baker Industrial Division
THE BAKER R & L COMPANY · · CLEVELAND, OHIO

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF
Baker

A General Utility Truck

ANOTHER type of Baker is also demonstrating its worth at the Mead-Morrison plant as an all-department machine unlimited in its usefulness.

A load carrier and trailer puller as well, sufficiently husky to shove a machine tool around, and with a platform large enough to carry bulky pieces crosswise, the utility truck is in continuous demand all over the shop.

The sturdy construction of all Baker material-handling equipment insures long life and uninterrupted service under the hardest of conditions.

The Baker catalog describes all models in detail. Write for a copy today, or, better still, ask a Baker engineer to investigate your conditions and submit definite recommendations without obligation on your part.

THE BAKER R & L COMPANY
Cleveland, Ohio

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Boring Under Ground for the Factory Water Supply

(*Continued from page* 17)

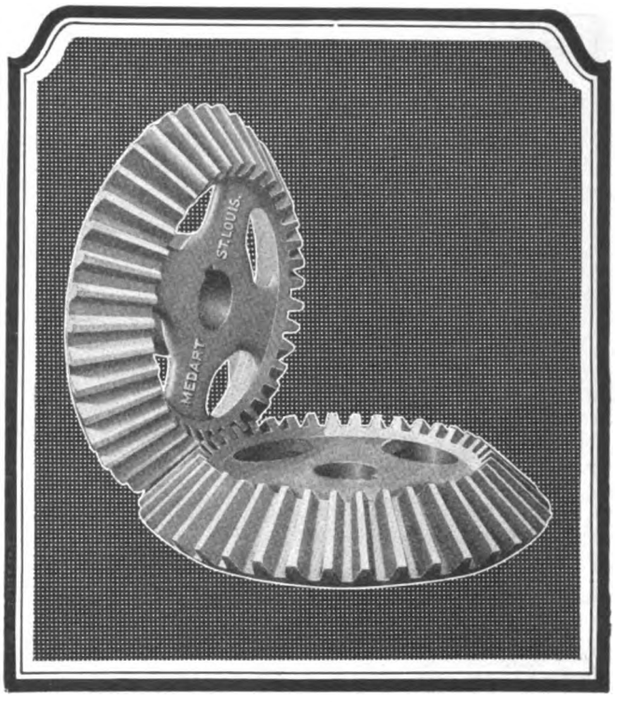
The diameter of large capacity wells ranges from ten to forty inches, depending on the depth and the quantity of water needed. At the bottom of the well casing some type of screen must be used if the water bearing formation consists of either sand or gravel. Within the casing must be placed the pumping unit itself and the discharge pipe to carry the water to the surface.

For many years it was thought that any type of screen could be used at the bottom of the well and that efficiency was determined only by the pumping unit. This idea is being rapidly changed by the many improvements in construction of the well itself. The true efficiency of a well is figured from the electric meter to the water delivered as the power bills represent energy purchased and the water delivered represents value received. However this overall efficiency can be divided into two parts—the efficiency of the well itself and the efficiency of the pumping unit.

Pumping large quantities of water from a well draws the water through the screening portion at a high rate of speed. The finer sand will be carried with the water and tend to cut away the metal screen. For this reason a well has a limiting capacity that can be pumped from it The increase of this limiting capacity in recent years is due to an improved method of well construction.

If the velocity of a stream of water is reduced to one-third of the original speed, it will carry in suspension sand particles much smaller than it would carry originally. Now the only way to reduce the velocity of water flowing into a well without cutting down the quantity of water is to increase the area through which the water enters or the circumference of the well screen itself. To increase the diameter of the screen would require a large diameter costly well, so an ingenious method has been devised to give this surface with a well of ordinary diameter. This method consists in surrounding the screen with enough coarse gravel to make the outside diameter of this gravel screen about three times the diameter of the original screen. This results in tripling the screen surface as the gravel is just as effective for screening purposes. Tripling the screening surface cuts the water velocity to one-third for the same quantity of water passing through or triples the quantity for the same velocity. This gravel screen or wall does not require construction of a larger well but is fed in around the screen as the sand is pumped out. It simply is a substitution of gravel for sand. This substitution of gravel for sand next to the screen makes it possible to use larger screen openings and thereby cut down the resistance to free flow of water into the well. However, it is necessary to select the right grade of gravel to give the proper screening effect.

The efficiency of the well also depends to a large extent on the construction of the wall or screen. If a well of a certain size is constructed, the static water level where the water stands when the well is not being pumped will be the same no matter what type of well is constructed. Water flows into a well due to a difference in head or pressure between the water in the surrounding strata and the water level in the well itself. In other words, the pumping level in a well drops below the static



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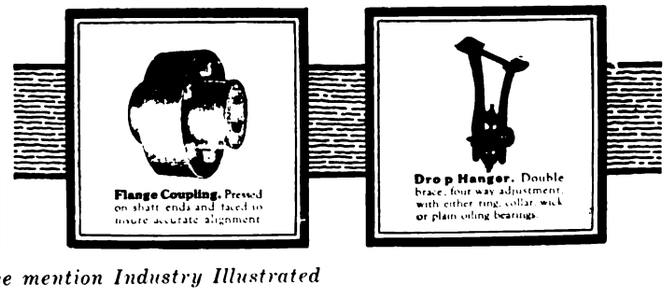
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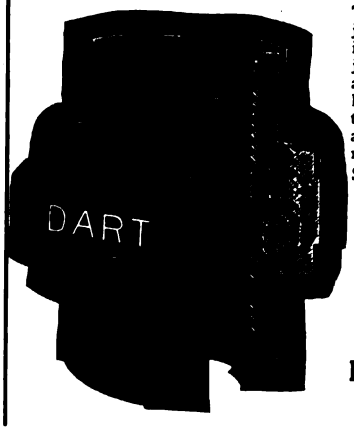
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level just far enough so that the head or pressure is enough to force the required quantity of water into the well. Any method of lowering the resistance raises the pumping level in the well and this is actually accomplished by the construction of the gravel wall well. Since the pumping level is higher in the gravel wall type of well it will require less power to actually raise the water to the surface. Power to raise water is determined by two factors, quantity of water and distance lifted. By cutting to a minimum the distance that the water must be lifted, the well construction is the best that can be made, and the method of pumping should then be considered on the same efficiency basis.

Methods of Pumping

The three usual methods of pumping deep wells are plunger, air lift and centrifugal pump. The plunger pump is efficient when new and suitable for small quantities of water but cannot handle large quantities. This is due to space limitations in the well and the fact that any reciprocating mechanism to be long lived and dependable must operate at low speeds. The plunger pump is also likely to give trouble when pumping water containing considerable sand, as the valves wear out quickly and the plunger scores the cylinder wall.

The air lift method will handle large quantities of water and employs no moving parts in the well itself; but this is offset by the fact that a compressed air supply or a separate compressor are needed. The compressed air at a suitable pressure from 25 to 100 pounds is piped to a point below the water level and discharged into the pipe which carries the water to the surface. The air lift has one inherent weakness, that of low efficiency The overall efficiency of the best and biggest municipal air lift plants from electric meter to water delivered is 30% to 36%. The usual air lift plants of moderate size have overall efficiencies from 15% to 25%. The air lift method gives no trouble if sand is pumped with the water, since there are no moving parts in the well.

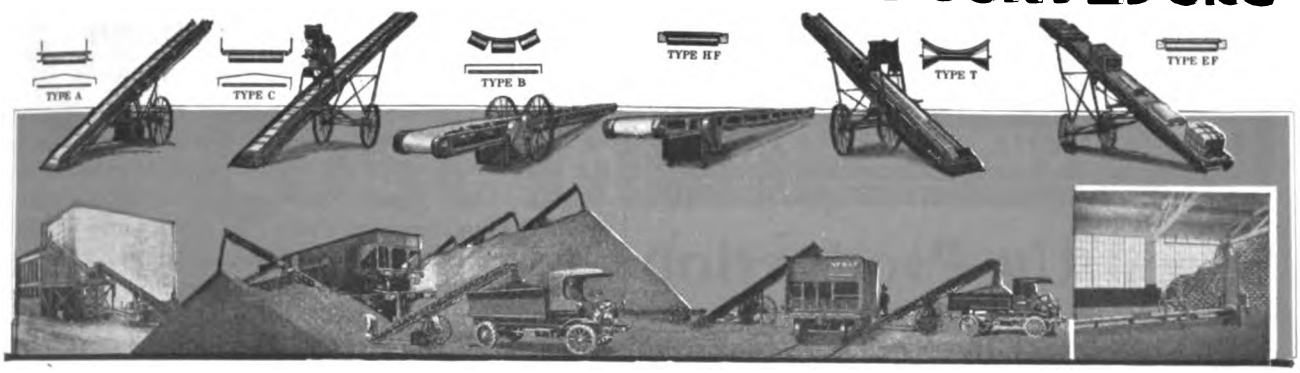
The third method of pumping deep wells is by vertical centrifugal pumps. This method will handle large quantities of water successfully and has the important advantage of high efficiency, ranging from 55% to 70% from electric meter to water delivered. The centrifugal pump is placed down in the well and driven by a vertical electric motor at the surface of the ground. The presence of sand in the water does not materially interfere with the action of the centrifugal pump since the pumping action does not depend on close clearances in the pump. The water can be pumped direct into the mains at service pressure by the same centrifugal pump that lifts the water, if desired.

Costs

The cost of constructing a well with the necessary pump and pump house varies greatly in different localities and definite figures cannot be given. However it is interesting to note in connection with the question of costs that this improved type of well construction has so increased well capacities that the output of water per twenty-four hours can actually be guaranteed. This removes one of the uncertain factors formerly present in attempting a well supply and places well construction on the same basis with any high grade commodity or service.

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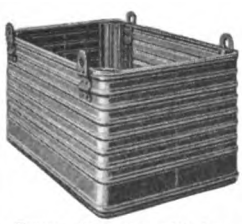
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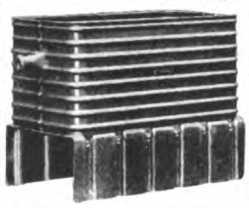
Speed Up Production



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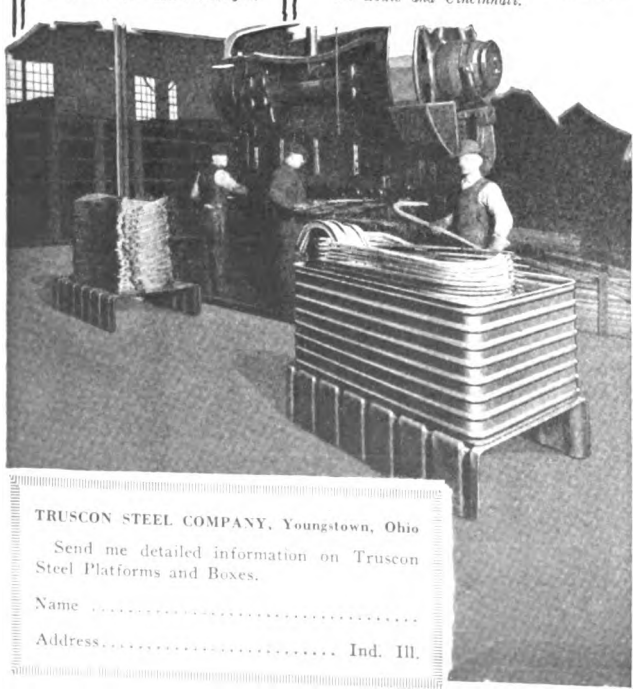
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Industry at Water-Level, Mountain, and Farm

(*Continued from page* 20)

problem. The small town can get these two together as the big city cannot. And the small town today has the conveniences of the city, if it wants to grow. Dansville, N. Y., a pretty country center of 6,000 people in the blooming Genesee valley 50 miles south of Rochester, has built industries from nothing to great success because it has built men and women.

Isolated? An unusual short-line, the Dansville & Mt. Morris R. R., connects the town with three trunk lines 15 miles away. Wood-pulp is imported from far Europe for its paper mill, and the Power Specialty Co. exports superheaters all over the world. This firm moved from

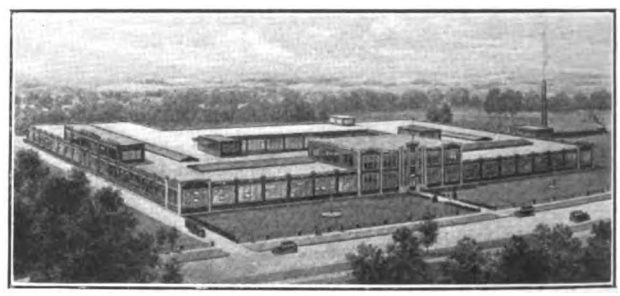


Fig. 12. The American Lithograph Company moved to Buffalo, which is a clearing point for many skilled workers, and is also within overnight reach of the great bulk of printing consumers.

New York in 1905 with 12 men. It now has 400 employees, who work *with* and not *for* the company.

The shoe and printing industries are flying to small towns from city labor troubles. The Blum Shoe Co. started here in 1885 with nothing. It now has 500 hands and sells a million pairs of its trade-marked felt slippers annually. The F. A. Owen Publishing Company started here also, four years later. Its "Normal Instructor" today inspires teachers in practically every school in the land. It has developed real printing craftsmen also.

Asheville, the Wonder Land of the Sky, surrounded by 60 peaks over 5,000 feet high! At 2,000 feet up, life is more exhilarating, life is better. Magnificent hotels, tourists from every clime, recreation, beauty—a world playground.

Asheville shows the other mountain areas of this country what they can do if they will. The Champion Fibre Co. develops a great pulp and paper industry at nearby Canton. The Balfour and Sayles interests from New England each build a gigantic cotton mill to utilize the native labor. The rich live-stock supply in these hills feeds the new packing plant of J. A. Baker & Co., and the hides supply large tanneries. Furniture factories are established. The Beacon Mfg. Co. of New Bedford opens a blanket mill. Three hundred years of pottery fashioning and textile weaving in mountain shacks provide the base for craftmanship industries. Meanwhile the Pisgah National Forest preserves an enormous forest for the tourist.

Thus, as industry decentralizes and locates scientifically it, too, finds life better and success more permanent, whether midst a Buffalo's rich advantages, a Dansville's productive coöperation, or an Asheville's climate and varied resources.

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January 6,1925.

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Our annex - one story industrial, 60' x 180', sides and end of glass, has been kept in a most comfortable condition by three of your units, which were only in operating condition during the last freeze-up here - 6 degrees below zero.

In conclusion, please refer any "doubting Thomases" to us, when occasion arises. We will gladly demonstrate the superiority of your product.

Very truly yours,
THE GENERAL WOODWORK CORPORATION,
By W. H. Reed
Treasurer.



Write for our Bulletins on Venturafin Heaters (435)

American Blower

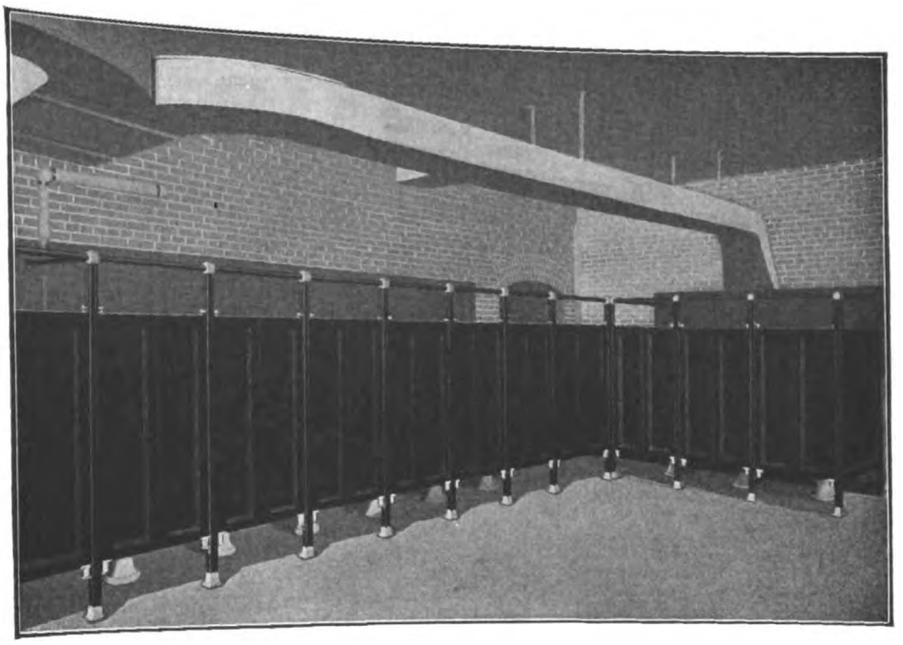
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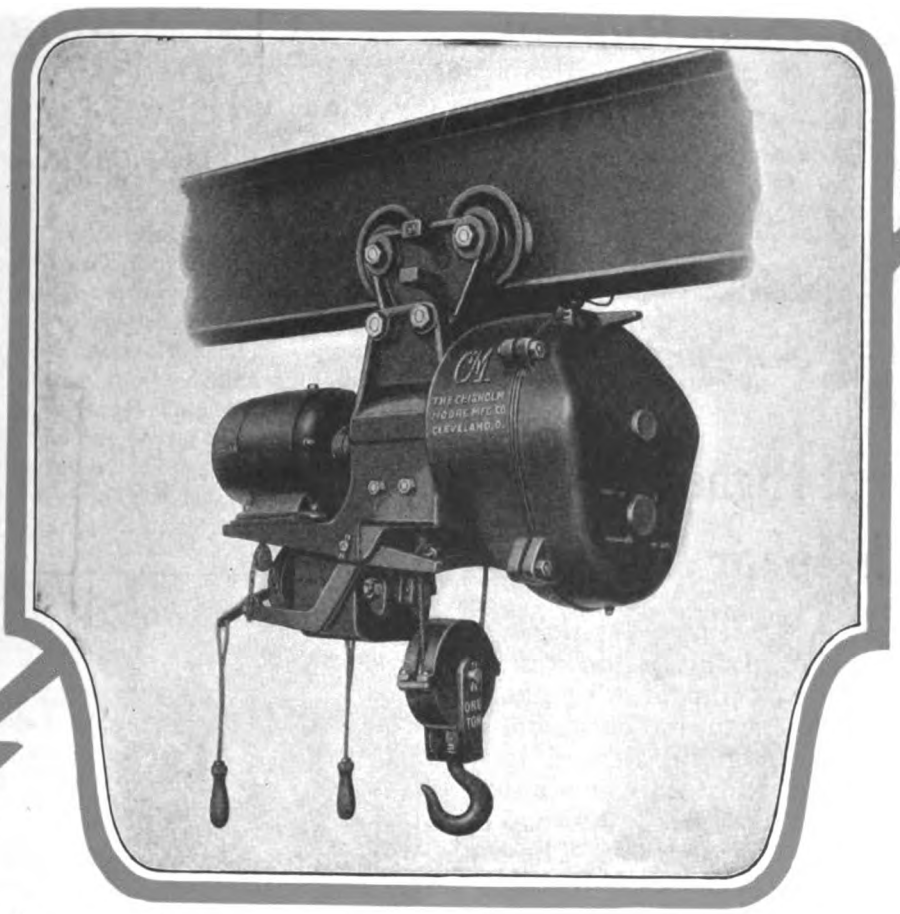


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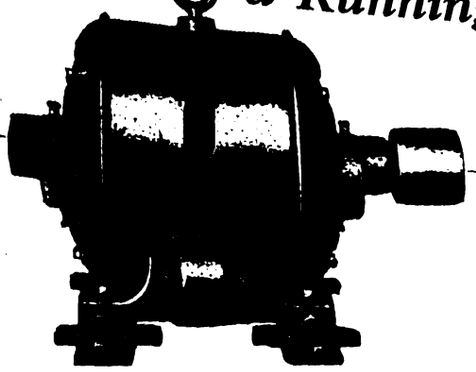
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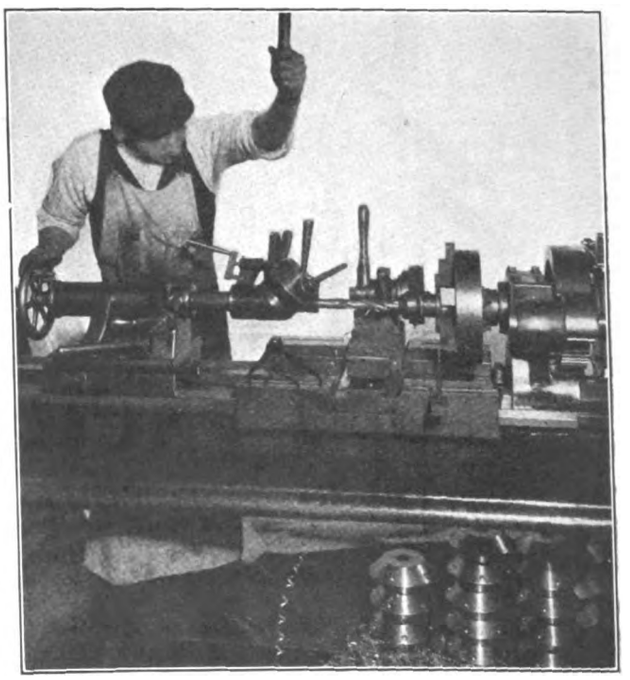
1/8 to 40 H.P. Century MOTORS 1/8 to 40 H.P.

The Value of Observation

By Donald A. Hampson

WRITERS on uplift subjects frequently touch upon the value of observation as a personal quality. It *is* worth while, and nowhere more so than in the machine business. Hundreds of bright mechanics ruin their chances of advancement because they fail to concentrate on their work—and concentration invariably leads to observation.

The writer had ample opportunity to notice this lack during a period spent as machine shop foreman. In passing around, dozens of important little things would be noticed that the men, sitting by the machines with nothing to do other than wait for a cut to run over, would



Modern tools, which call for less actual work by the men, yet require trained observation all the time. The man who "doesn't notice" a dull tool, or an overloaded one, or a hot bearing—is under a handicap.

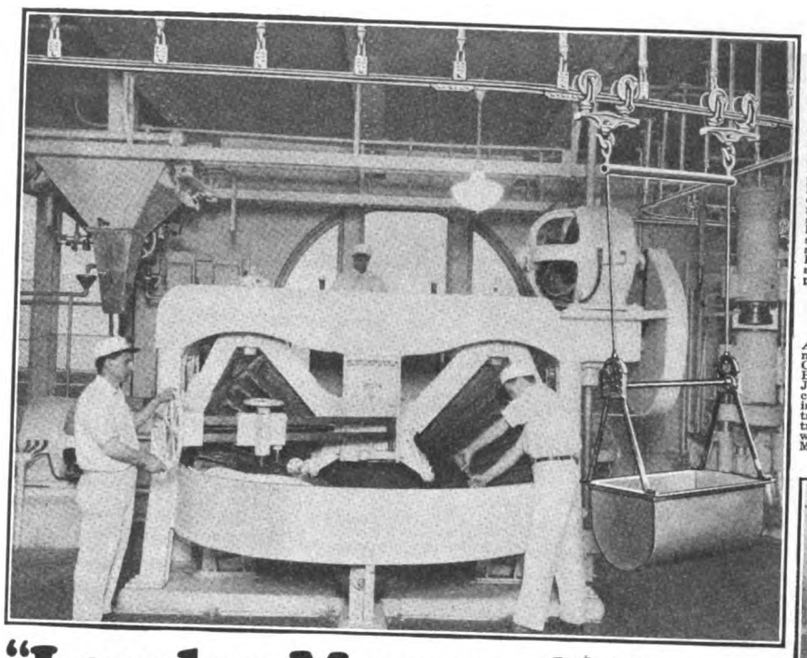
fail to observe. Here was a chap trying to cut with a milling cutter on backwards; here a tool that showed by the chip that it was dull; there was a planer tool chattering on a finishing cut because the machinist had neglected to tighten the cross rail bolts on the off side; and other there a fellow was trying to do a nice job of grinding with a wheel that was badly loaded.

All of these things off color would be noticed, in passing by, in the long walk-day of a foreman. But lack of observation is not confined to mechanics alone, as the following incident will show.

An executive, who wanted another 48-inch planer in his shop, searched the "ads" and dealers' stocks for months before he found one they could afford to buy. This machine he looked over thoroughly where it was, and from this deliberate inspection he ordered it. The machine was of good make, in first class shape, and heavy—a 14-ton machine.

(*Continued on page* 64)

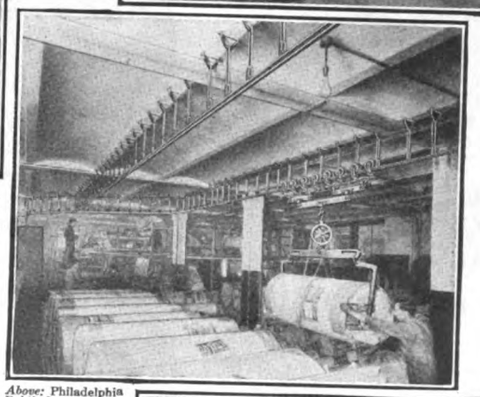
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At left: In Spaghetti and Macaroni Dept., H. J. Heinz Co., Pittsburgh. Only part of installation shown. There are two kneading machines, four presses to each kneader. Louden system connects all units, so either kneader can supply dough to any press. Dough carriers are nickel plated.



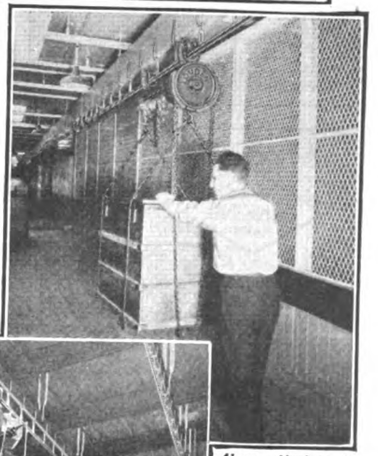
At right: International Motor Company, New Brunswick, N. J. Here current conductors are installed along track and electric hoist is used with Louden Monorail.



"Louden Monorail Saves Us $7500 a Year"

(Report of United Metal Mfg. Co., Norwich, Conn. A return of several times the investment annually)

You will find Louden Monorail Systems conveying materials in practically every line of manufacture and production. This is indicated by the pictures shown on this page. The conditions of installation are different. Their loads and material handling problems are different. But they all unite in testifying to the efficiency and economy of



Above: Philadelphia Public Ledger rotogravure press room. Louden system handles 200 lb. to 2,000 lb. rolls of paper to storage and from storage to presses.

LOUDEN
OVERHEAD CARRYING EQUIPMENT

They report economy under many headings—saving of wages—of time—of labor turnover—of floor wear—of accidents to men—of breakage in material—of floor space. Not to mention the effect of better working conditions on the morale of employes.

"Our Louden installation has greatly reduced breakage and saves us $5000 a year in wages."—Architectural Tile Co., Keyport, N J. "We now use two men where we used to use six."—Southwest Veneer Co., Cotton Plant, Ark. "We highly recommend it for speeding up and maintaining maximum production."—Light Manufacturing & Foundry Co., Pottstown, Pa. "Saves 40% labor in roll paper stock room, reduces operating costs 8%."—Egry Register Co., Dayton, Ohio. "Paid for itself easily in three months' time."—Walter N. Pincus & Schulhof Co., Chicago.

Louden Monorail handles every carrying job up to 2,000 lbs. in practically *any* business. It would be hard to imagine manufacturing or material-handling conditions to which it could not be adapted, and the moderate cost of a complete system is an item that is also extremely interesting. It deserves your investigation.

Let us refer you to an installation in your vicinity or advise one of our nearby Engineers to call and go over your plant for the purpose of making a report to you. Without obligation, of course. Simply set a date to suit your convenience.

Send for Louden Overhead Book

Illustrates and describes this efficient, cost-reducing equipment. Pictures installations in various industries—from a few feet of track to many miles. Tells an interesting story of how other concerns have cut production costs. Send for your copy.

THE LOUDEN MACHINERY COMPANY

586 West Ave. *(Established 1867)* Fairfield, Iowa

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Above: Abraham & Strauss, Inc., dept. store, Brooklyn. Twin chain hoist used with Louden Monorail to move 1,000 lb. hamper from receiving to distributing dept. Two such loads are easily moved by one man.



W. E. Hooper and Sons Co., Baltimore, Md. One man easily handles and stacks 1200-lb. bales of cotton and cloth scraps with electric hoist and Louden Monorail.

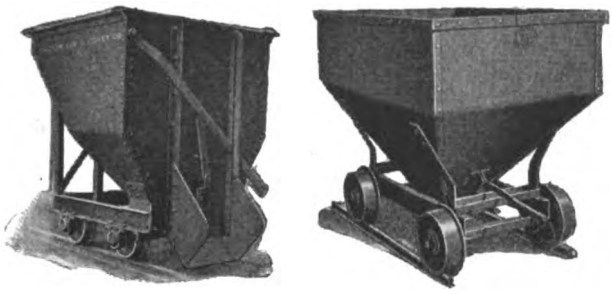


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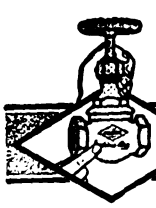
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Sectional View, Fig. 128, screwed. Extra Heavy Bronze Globe Valve.

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JENKINS BROS., LIMITED
Montreal, Canada London, England



Always marked with the "Diamond"
Jenkins Valves
SINCE 1864

(*Continued from page 62*)

When the tool was being set up in the buyer's shop, the executive stood watching operations when one of the planer hands slipped alongside for a moment, to say an admiring word to his superior about the new machine. Rather offhandedly, he remarked, "I see the heads don't swivel." True enough, it was a planer built for special work of a class that didn't require anything but straight horizontal and vertical cuts and so the heads had been built without the swiveling member that is necessary for taking angular cuts. Unfortunately, this was one of the kinds of work it had been intended to do on the new machine. And the executive had not noticed this when making his inspection!

A rather amusing incident of this same kind taught a bright young chap a valuable lesson. During the summer vacation of his technical school, he was working in a railroad shop's drafting room. The Chief sent him out to get some frame measurements from a locomotive on the dead storage track. It was necessary to crawl between the wheels and get inside to make the measurements. Back in the office, the Chief took the sketch and, more to refresh his memory than anything else, he asked, "That's a Baldwin ten-wheeler, isn't it?" To which the junior was forced to reply that he hadn't noticed whether the locomotive had ten wheels or eight and he never thought to look for the name plate.

Just as showing how the observation habit may be cultivated, the case of a dealer in machine tools may be cited. He hadn't been brought up in the business or in any machine shop line but he entered the used machinery field in middle life, about the year 1912. Of course, there was a good deal of money made in this line during the war (it was frequently said that anyone could get rich in machine tools then) but there were also some conspicuous failures—many of them coming tumbling in a heap when the war suddenly ended.

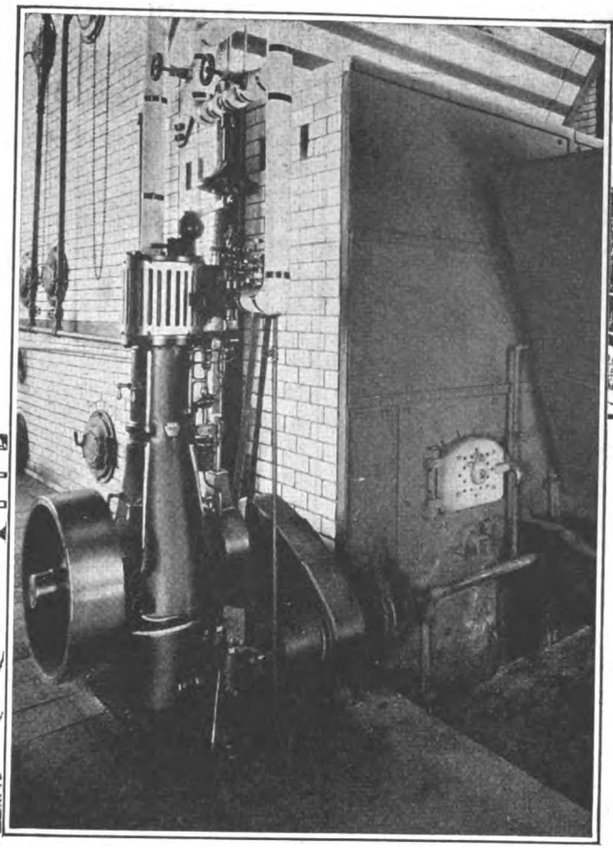
However, this man became firmly established and his dealings were, and are, noted for fairness all around. To do this, one must buy closely, must know selling values, and above all must know machines on sight, including their vintage and scope. The writer has known this man to go into a shop where machines were for sale and walk down the aisles, looking to right and left as he went, sizing up the tools and making an offer for the lot at the end of his walk, which might have been one or two city blocks long. And his judgment was unerring, showing to a wonderful degree how observation may be cultivated.

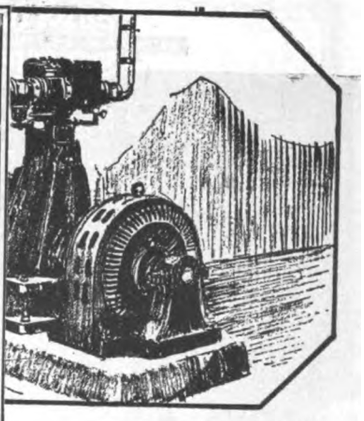
THE ever-flowing tide of business activity is rising slowly but steadily. There are the customary cross currents and eddies. But the outlook for sustained improvement with the coming of spring is well supported by current conditions.

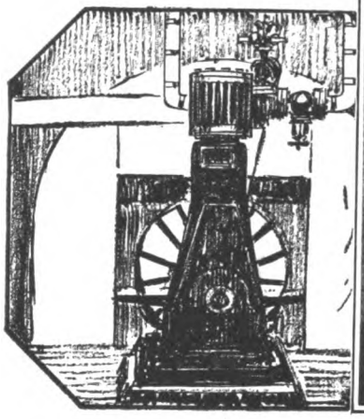
The permanence of the present upward movement is fortified by the recent halt in the upward trend of prices. The threat of price inflation is withdrawn. Apparently buyers as a whole will not be stampeded into hasty speculative action; and sellers are inclined to keep down costs and prices.—*La Salle Extension University.*

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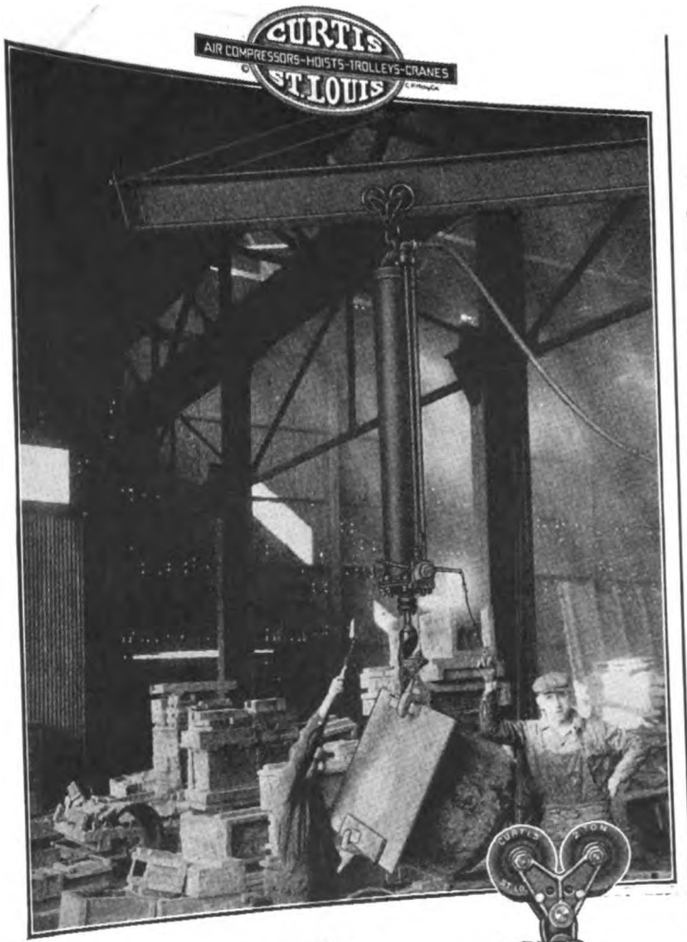
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Air Hoists *and* Trolleys

Speeding Production on Modern Machine Tools

(*Continued from page* 23)

Years ago we used to cut dry, regardless of the nature of the metals involved. And look back to the crude results attained, the low rates of production, and the costs of tool upkeep and repair.

Today, certain metals, such as cast iron and aluminum, are still frequently dry cut, due to the fact that a mixture of metallic dust with cutting oil would perhaps cause congestion around the tool and cutting area. Steels and the other metals which are usually handled, however, have been proven to develop the best results if the cutting tool is maintained at an approximately fixed low temperature by the use of a fluid coolant which will at the same time serve as a lubricant between the tool itself and the stock being cut. This is especially essential where deep cutting is being performed. The wonderful production records which have been attained in so many modern industrial plants are directly due to the adoption of this procedure. Take away their cutting oils and tool coolants and they would probably revert to the "middle ages" period in machine shop operation. In other words, one of the most important items in the modern shop is its cutting oil or tool coolant. In addition to the aforesaid advantages, such a lubricant or coolant also aids in producing a smoother cut, protects both the tool and work against rust and corrosion, and serves to wash the chips away from the cutting area.

During the experimental stage through which the machine tool industry naturally passed, water was probably the first recourse in the shop to reduce cutting temperatures and speed up production. But water causes rust; therefore, the addition of soda and water mixtures followed, primarily because these apparently reduced the extent to which corrosion and rust formation occurred. Water, therefore, was the basic factor in keeping the tools cool, though it did not serve to lubricate the cutting tool faces to any great degree. So, naturally, oils, by virtue of their lubricating properties were resorted to. Immediately an age of experimentation came into being, for oils, with their extensive range of characteristics presented a vast field to chose from. The ultimate result of this could almost have been foretold, i. e., that today cutting compounds and tool coolants of an extensive variety would be available to meet the requirements of the machine tool industry.

Broadly speaking, the majority of these will involve mineral oils, compounds of mineral and lard oils, or the so-called soluble oils which are used after mixing with certain percentages of water. When oils were first adopted pure lard oil was very extensively used for cutting purposes. Lard oil, just like other oils, is more of a lubricant than a coolant, as compared with those products which are designed for mixing with water before application. Therefore, where cooling is essential it would not be so satisfactory, especially as its cooling ability decreases with re-usage. Furthermore, lard oil, like other fixed oils, has that tendency to deteriorate, gum and turn rancid after a certain period of usage. This all tends to develop acidity which is detrimental to the polished surfaces of both the tools and the work. Then again, lard oil is a relatively very expensive prod-

(*Continued on page* 69)

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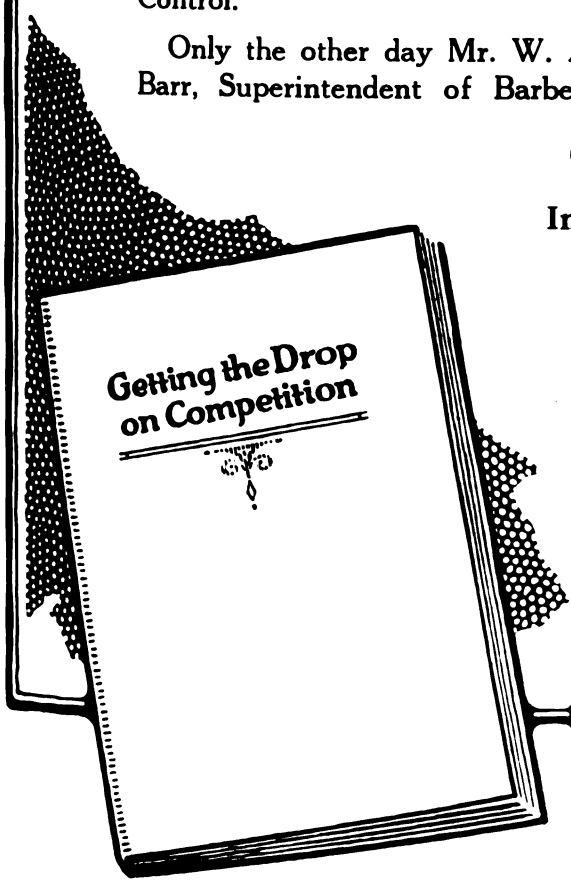
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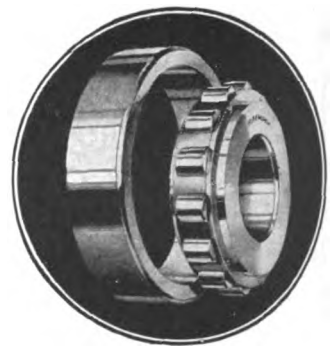
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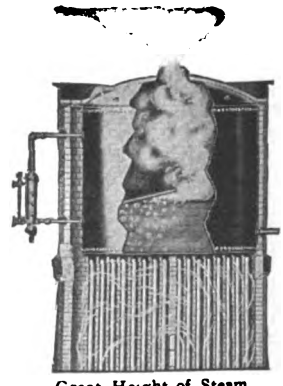
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(*Continued from page 66*)

uct when we consider the quantity which is necessary to serve the average high speed cutting tool. With all this, however, pure lard oil as a cutting lubricant, where lubrication is the essential factor, has many adherents in the machine tool industry today, who claim for it the important feature of smoothness of cutting.

On the whole, however, lard oil is not the most generally suitable product to use. Rather, straight mineral oils of low or medium viscosity (according to the tool speeds developed), or mineral-lard oil compounds are more usually preferred for all round service. In certain cases straight mineral oils of medium viscosity will give quite as satisfactory lubrication of cutting tools as will pure lard oils, they will be cheaper, and the possibility of acidity, rancidity and gumming occurring will be remote. Furthermore, wherever straight mineral oils are used for cutting, the same oil can also be used to lubricate the guides, bearings and frequently the gears of the machine itself. Straight mineral oils, while they lubricate

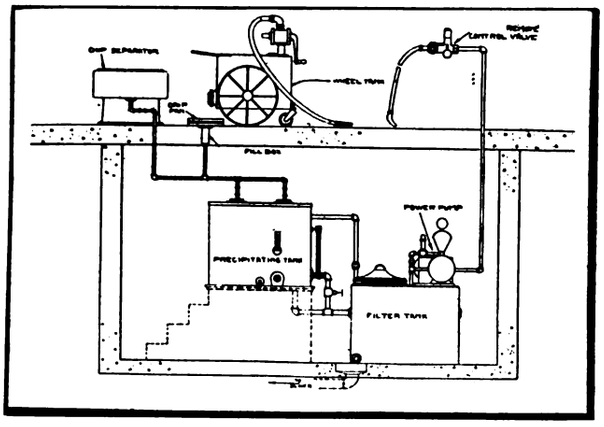


Fig. 11. Line sketch of a cutting oil reclamation system showing the necessary piping from all the equipment, the relative sizes of tanks, chip extractor and oil purifiers, and the manner in which chips are transferred directly to the system. This is an extremely compact layout.

effectively, lack that certain degree of "oiliness" which is possessed by lard oil, and which is regarded by many operators as being so essential to high speed cutting of certain metals and alloys. For this reason mineral oils are compounded with lard oils in varying percentages, according to the lubricating requirements, cutting speed, depth of cut, means of application and material involved. In this way a combination of advantages is derived, i. e., the "oiliness" or lubricating ability so inherent to fixed oils is present to a sufficient extent to meet average requirements, yet the price of the compound is maintained within reasonable limits.

Fixed and mineral oils, however, while they may be excellent cutting lubricants, have a relatively low ability to absorb and transfer heat away from the cutting tool. Under lower operating speeds and light or medium cuts on softer materials this is, of course, not always a vital factor. But the planing, milling or boring of high speed steels oftentimes develop so much heat that provision must be taken to keep the cutting tool cool. Otherwise it may become damaged or prematurely dulled, with the result that production may fall off markedly.

On such work, therefore, a compound must generally be used which possesses as nearly as possible the high

(*Continued on page 72*)



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With clean glass — an abundance of perfect light.

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(*Continued from page 69*)

cooling ability of water, as well as the basic lubricating properties of oil. To serve this purpose cutting pastes and soluble oils are generally used. These are products consisting of light mineral oils in compound with soluble soaps or saponifiable products. By virtue of these constituents such compounds should be miscible with either hot or cold water to form permanent emulsified liquids under continued usage.

Soluble oils and compounds more nearly attain the ideal which the modern cutting oil and tool coolant should possess. In other words, with a properly compounded oil heat is removed from the cut and tool at the desired rate, the presence of oil prevents rusting and corrosion to any marked degree, the possibility of acidity, oxidation and gumming occurring is rendered more remote, and the price of the resultant cooling emulsion per gallon is kept within reasonable limits.

In connection with this matter of tool cooling, it is interesting to look briefly into the reasons for the generation of heat. Primarily this is due to the distortion of the chip and the frictional heat developed in the tool through contact with both work and chip. In general, it is the tool with which we are concerned, any development of heat in the work being only important from the viewpoint of the effect it might have on the size and accuracy of the cut. Under ordinary conditions a cutting oil of average characteristics will reduce this heat within safe limits.

The effect of such friction on the tool, however, is a different matter. On many machines where deep work is to be cut or long holes to be bored, the heat developed along the tool may easily become cumulative. In other words, the cut may be so inaccessible that merely sluicing the tool with lubricant may not serve the purpose. In many such cases it has been found advantageous to provide some means for forcing the lubricant into the cut in front of the tool. Cooling in this manner, under sufficient pressure and volume, not only washes out the chips with the least amount of friction, but also literally carries away the potential heat of operation before it has a chance to enter the tool.

To bring this about, the trend of current practice is towards pressure lubrication of cutting tools today. In this way the control of the flow of coolant or lubricant is rendered practically automatic, and subject often to the speed of the machine itself. As a rule the coolant pump is direct connected to some moving part of the machine; as a result it is subject to the motion of the latter. Oil is thereby delivered only when necessary. On some machines automatic checks are installed in addition, which increase, reduce or stop the flow of liquid commensurate with the cutting action. As a result the maximum of economy is claimed.

The necessity for such accurate control of the coolant can be appreciated when we realize that cutting speeds of from four hundred to eight hundred peripheral feet per minute are quite practicable on steel of average physical characteristics, provided the coolant can be delivered at such a rate and pressure that it will maintain the temperature of the tool within the limits prescribed by good practice.

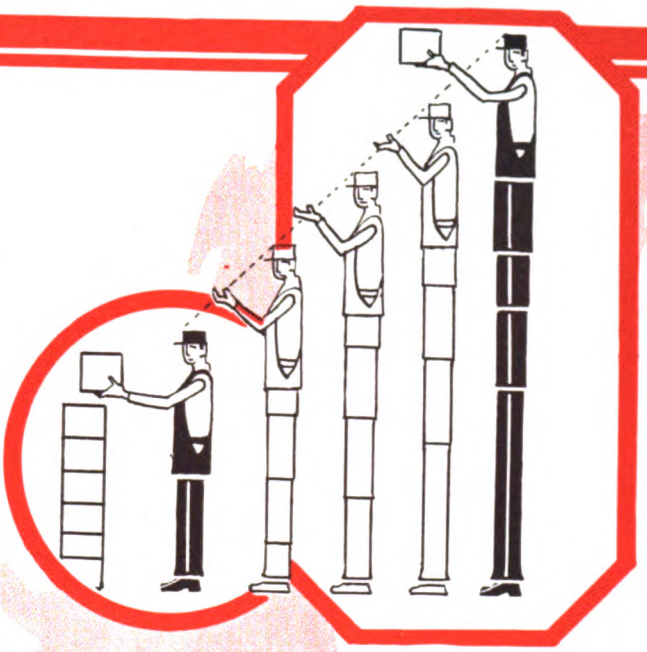
Reconditioning of Cutting Oils

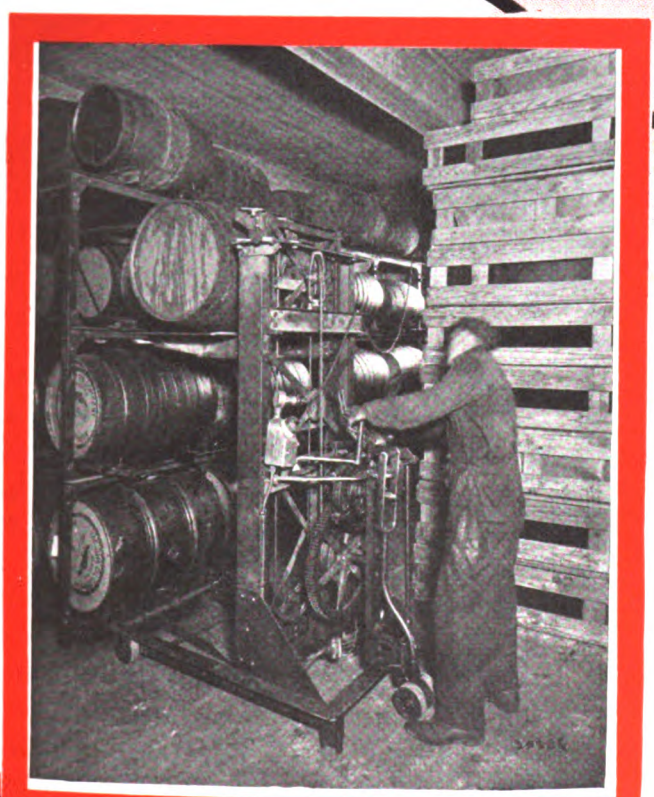
But, however precautious we may be in selecting a cutting or soluble oil adaptable to the conditions in our

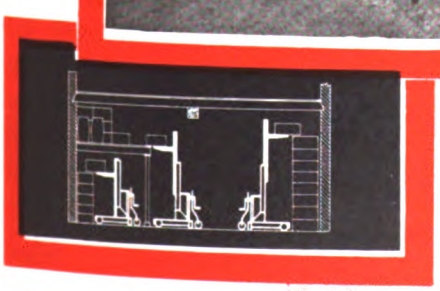
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just like having a "Mutt and Jeff" in one body.

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Well there is such a man—a mechanical man, who comes as strong as desired and to any height to fit your requirements.

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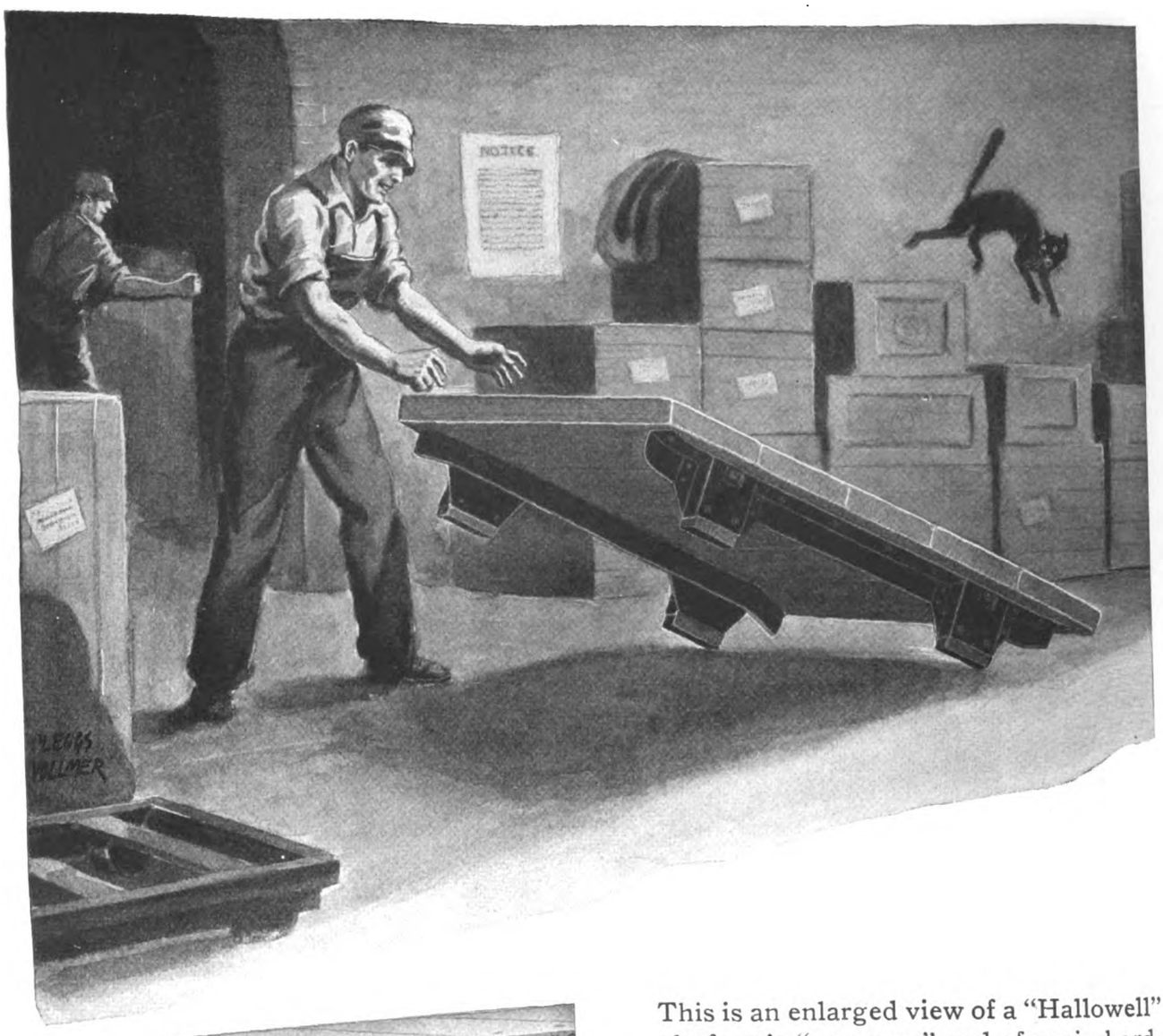
—let us tell you more about him?

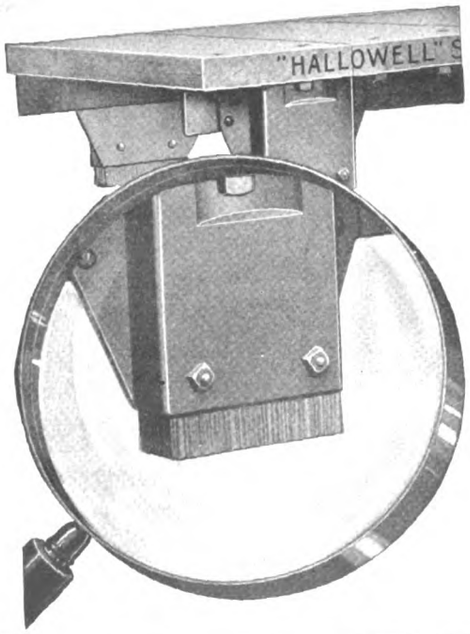
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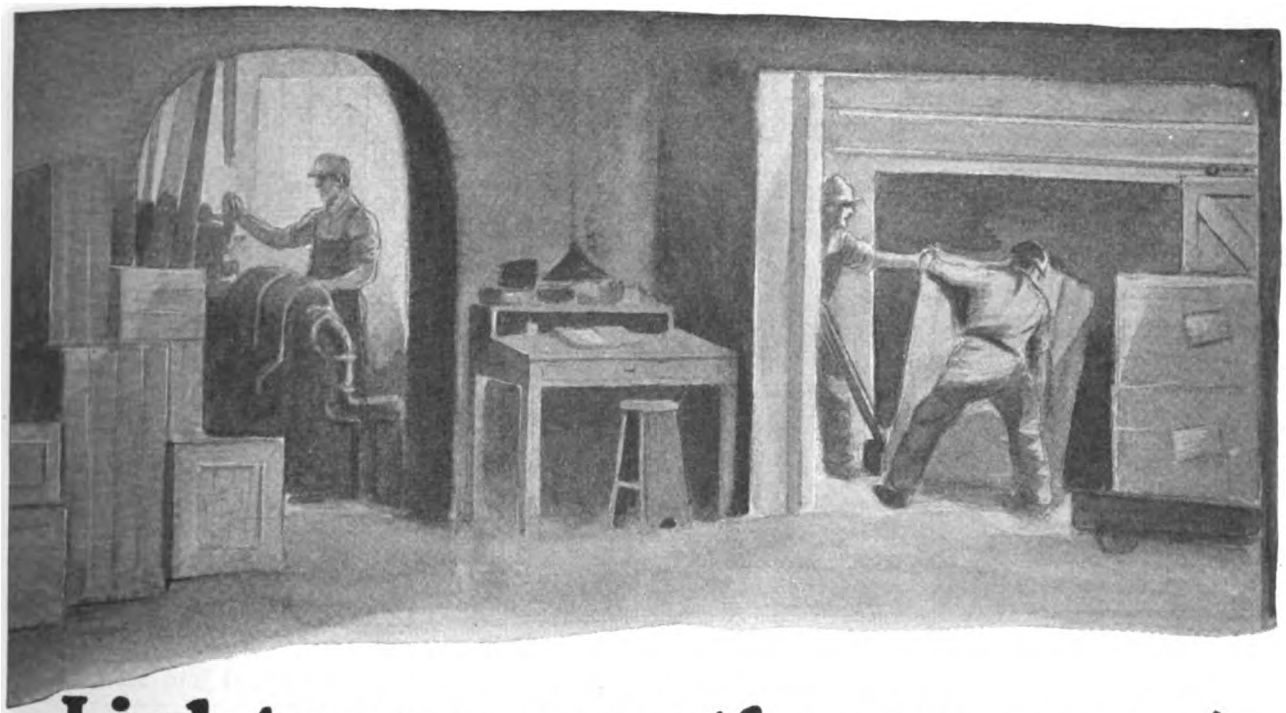


This is an enlarged view of a "Hallowell" platform's "cats-paw" end-of-grain-hardwood foot. These feet will wear almost forever, as will the platform. As the picture shows, the planking is securely fastened to heavy angle steel runners, to which are *hydraulically riveted* the steel leg holders which take the hardwood feet set on end of grain. The result is a truck platform of tremendous strength, stronger and better than you can build yourself or buy elsewhere. And, regardless of the way your men drag and bang them about, the "cats-paw" feet protect your floors.

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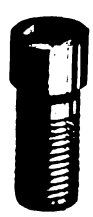
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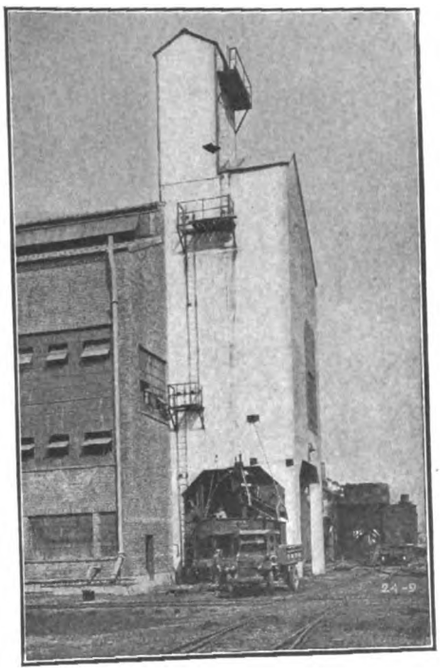


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While means to stimulate the growth of business are in progress, the executive should not lose sight of the fact that unless he is fully equipped with up-to-date mechanical devices to aid in production, he will be handicapped when the demand for volume output comes.

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Manual labor for handling coal and ashes, as well as unsuitable mechanical apparatus are dual "profit eaters." The former method is becoming rare, but still exists in some plants; the latter method, because of its unsuitability is costly when untimely breakdowns cause expensive interruptions, heavy repair bills, inordinate upkeep and other irritating troubles.

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(*Continued from page 72*)

shop or plant, unless this oil in actual operation is maintained in a suitable state of purity and free from chips and foreign matter, it will fall short of the desired end. It is no longer considered good practice to discard cutting oils. Re-usage is practically an economical necessity. Even the re-circulation of used oil is not recommended without at least the removal of the major portion of the metallic impurities.

The application of oil reclaiming equipment to the reconditioning of tool lubricants and coolants such as cutting oils, etc., may involve perhaps but the installation of a centrifugal chip extractor and oil purifier, or a chip settling tank with a suitable oil filter. In such cases the oil might have to be transported to and from the machines by hand, the reclaiming equipment functioning only periodically. On the other hand, to attain the best results from such equipment, whatever its design, the installation of suitable piping to and from all machines involved has been developed.

The extent to which such a layout should be planned will of course depend upon the number and location of

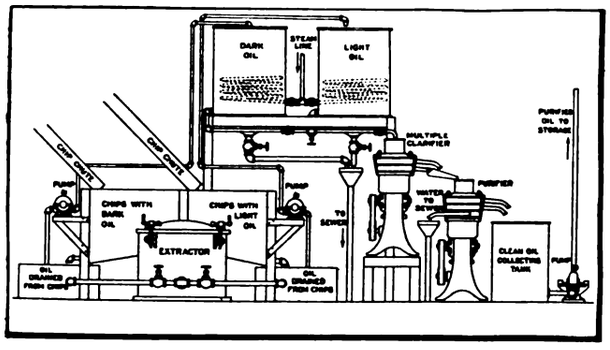


Fig. 12. Layout of a modern cutting oil filtering system. Here the used oil from the various machines in the shop is drained to a filter especially designed to handle oils of this nature. Filtration of this sort is claimed to bring back such oils to a state of purity equal to that of new oils. In this system, sterilization of the oils can also be effected wherever it is necessary and advisable to free them from infectious bacteria. This is oftentimes an important matter in many plants.

the machines. For example, where the shop is arranged in units it will often be advantageous to use a small central reclaiming system for each unit or set of machines. In many cases a number of installations of this nature will prove the most economical, and will eliminate the necessity for extensive piping layouts and bulky storage tanks. Furthermore, smaller and less expensive centrifuges or filters can be used to good advantage.

The necessity for installing a purifier for each machine will usually not be pressing unless the latter is an especially large unit operating at such high speeds as to require the delivery of a relatively large volume of coolant per minute.

In general, after any cutting tool coolant and lubricant passes through the machine it is led to suitable drains. From these it can be piped directly to the reconditioning equipment for reclaiming. The chips, however, which are the product of the cut will contain quite an appreciable amount of oil. Therefore, they should be taken to a settling tank or centrifugal chip extractor, which will reclaim this oil and render it adaptable to further treatment in the reconditioning apparatus. The centrifugal chip extractor is claimed to effect a high degree of



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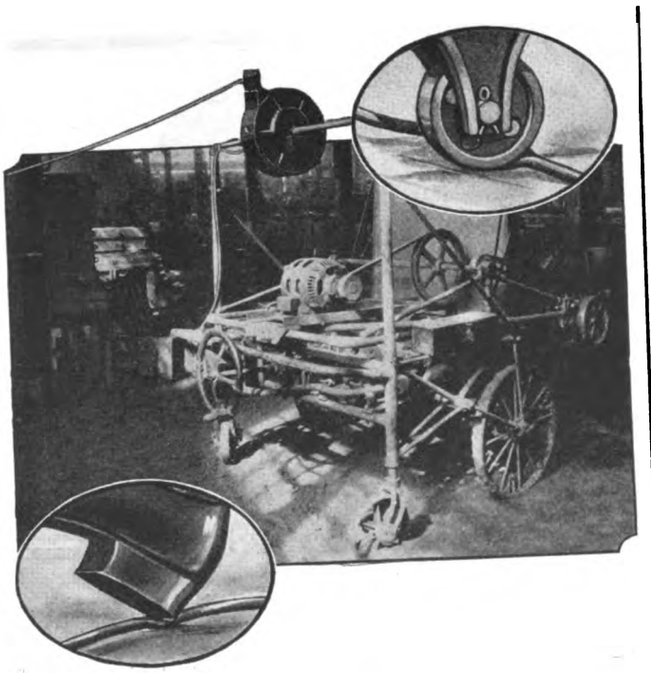
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oil extraction, thereby adding to general shop economy to a marked extent. In appearance it is very much like the hydro-extractor so familiar in the modern steam laundry.

Of course, the general arrangement of any cutting oil reconditioning system, and the equipment to use will depend to a large extent upon the nature of the coolant. For example, to merely reclaim oil from the chips an extractor or chip basket would be sufficient. Where this oil is to be further reconditioned, however, or where cutting oils or compounds are to be purified, or cutting oil is to be reclaimed from soda-wash for example, the centrifuge or oil filter, both so familiar in steam turbine practice, should be used. A number of typical layouts of such installations are shown in the accompanying illustrations.

Advantages of Reconditioning Cutting Oils

Probably the factor which influences most machine tool operators in favor of the oil reclaimer is the fact that the current oil bill can usually be markedly reduced, with but a relatively small increase in the cost of plant equipment. There are other distinct advantages, however, which certainly are material enough to put over an oil reclaiming installation even though the saving in oil consumed might not seem of much account. For example,

(1).—The cutting tools receive the greatest protection due to the fact that the oil is kept free of chips, scale and dirt, which would not only tend to dull the cutting edges but would also probably increase the amount of power consumed.

(2).—Considerable time is, therefore, saved because tools do not require as frequent sharpening, and both machines and operators can be relied upon for more continuous production.

(3).—The increase in speeds also promote increases in production with usually the possibility for greater accuracy in cutting.

(4).—Oil temperatures are reduced with the result that not only the cooling but also the lubricating value of the oil is enhanced. Furthermore, by maintaining a cutting oil at lower temperatures the tendency towards oxidation, the development of acidity, and the possibility of gumming, are reduced. Acidity and oxidation are regarded by many authorities as decidedly detrimental due to the fact that corrosion and pitting of both the tool and work may be promoted.

(5).—Therefore, a higher grade of oil can be used which will give satisfactory service over an extended period of time, with but little danger of foaming, etc. This affords far better lubrication of the tools, and wearing parts where the one oil is used throughout the machine. All this compensates for perhaps a slight increase in first cost.

(6).—Considerable labor is also saved by such a system, for the old familiar method of carrying oil to and from each machine or tank is usually done away with. Furthermore, considerable waste is saved because in most cases the oil is pumped continuously through the system, and there is no manual filling or emptying of oil tanks, etc.

(7).—General cleanliness around the shop is promoted, for the modern reclaiming system eliminates drips and spilled oil to a large extent.

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Cutting down upkeep on ROOF, on FLOORS, on WALLS

Skilled plant executives do not experiment with unknown products when it comes to maintaining their buildings in good condition. They follow the proved experience of leading industrial concerns—concerns that did their experimenting long ago. Just such experience is embodied in the suggestions below.



At the left is the Famous-Players-Lasky Company's building at Long Island City, New York. Three years ago the outside of this building was painted with Exterior Cemcoat. Though brick and concrete end the life of most paints very quickly as a rule, the Cemcoat has retained its original whiteness and adhered to the walls just as well as other paints do to wood. All the concrete floors in this building are hardened with Lapidolith.



The Campbell Soup Company, Camden, N. J., (at left) has concrete floors that are permanently dustproof, wearproof, and waterproof. The 55,000 square feet of concrete floor surface was treated with Lapidolith, the liquid chemical floor hardener.

The owner of the plant below is saving hundreds of dollars by covering his old roof with Stormtight in place of re-roofing. In the photograph the men are applying semi-liquid Stormtight with brushes. Plastic Stormtight—for sizeable holes, is applied with a trowel.



FLOORS—An ordinary concrete floor in industrial service gives off a fine harsh dust. This dust is breathed into workers' lungs; it settles on machinery, material, and equipment; and is almost as harmful in its effect on them as powdered emery.

Furthermore, this dust is a sign of floor disintegration. Before long it is followed by holes and hollows that necessitate your laying a new floor surface or making repairs. Yet it is a simple matter to fix your concrete floors so they will never dust or wear. A treatment with Lapidolith will make them granite-like in their hardness.

Lapidolith is a liquid chemical that acts on the concrete, hydrating the free lime and changing the coarse structure to a fine-grained crystalline formation that is flint-like. The result is a surface that resists the hardest kind of wear indefinitely. It is acid-resisting. It is waterproof. It is dustproof. The application can be made on either a new or an old concrete floor—overnight, and by morning the floor is ready for business.

If you have wood floors you can prevent them from rotting, splintering, or drying out by an application of Lignophol. This preservative dressing penetrates the wood, restoring its natural oil and gums. It lays the dust and does away with frequent applications of floor oils. Lignophol is odorless and non-inflammable. It turns out a floor that is smooth, hard and sanitary, one that stays that way for many years.

PAINTED SURFACES—If you paint walls and ceilings with Cemcoat—the gloss, eggshell, or flat enamel paint—you will have interiors that are not only lastingly bright and cheery, but also easy to keep clean. A Cemcoated surface can be washed again and again; and no matter how dirty the wall may be, the paint comes forth clean and white.

Cemcoat retains this whiteness long after other paints turn yellow. It is resistant to heat and fumes. It usually requires one less coat than other paints because of its body. It adheres to brick or concrete as easily as to wood, for it is not affected by the free lime that is always present in these. Cemcoat is a beautiful, durable, and economical paint, made for exteriors as well as interiors in white and colors.

EXTERIOR WALLS—If you would have warm, dry interiors no matter what the weather, and if you would preserve the natural beauty of your walls, treat the outside of your buildings with Hydrocide Colorless. This material is a perfect waterproofing for brickwork. It penetrates the brick; it contains no paraffin, and so does not run in hot weather; it collects no dust; it can be painted; and, best of all, its presence on a wall cannot be detected.

ROOFS—A small leak or a large leak in the roof of any of your buildings can be lastingly repaired with Stormtight. This adhesive, rubber-like coating can be applied by anyone in a few minutes over any roofing material. At the same time Stormtight will make an entire roof just as waterproof as a single leak. Many an old roof about due for replacement has been made as good as new by an application of Stormtight, thus saving the owner hundreds of dollars. Stormtight is made in semi-liquid and plastic form, and is packed in containers of various sizes.

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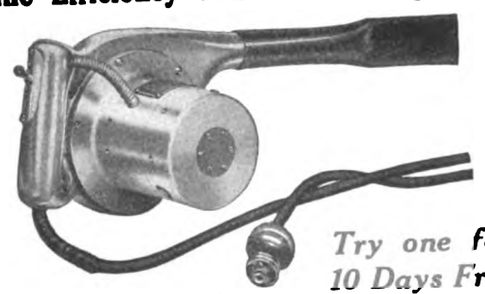
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How Machine Telephone Switching Works

(*Continued from page 32*)

soon becomes accustomed to the idea and takes it for granted. Although this is inevitable it is at least worth while to obtain some conception how this almost human apparatus works while it is still comparatively new to most people.

The system which is used in New York follows a sequence of operations surprisingly similar to those of a manually switched connection. How a connection is established by means of machine switching and the analogy to manual switching is shown in the diagrams (Figs. 3 and 4) and the appearance of a typical line-finder frame may be seen from the photographs. To make clear the steps shown in the two diagrams, following is a brief description of the sequence of operations —keyed, to refer to the charts.

(1) Garfield 3465 is permanently connected to the horizontal strip on the line finder frame. Other lines in this exchange terminate in the strips above and below. When the receiver is removed from the hook the line finder picks up the line. This corresponds to lighting the switchboard lamp and the insertion of the operator's cord in the answering jack with the manual system. The line finder is connected permanently to a sender selector, which, in turn, is permanently connected to a district selector.

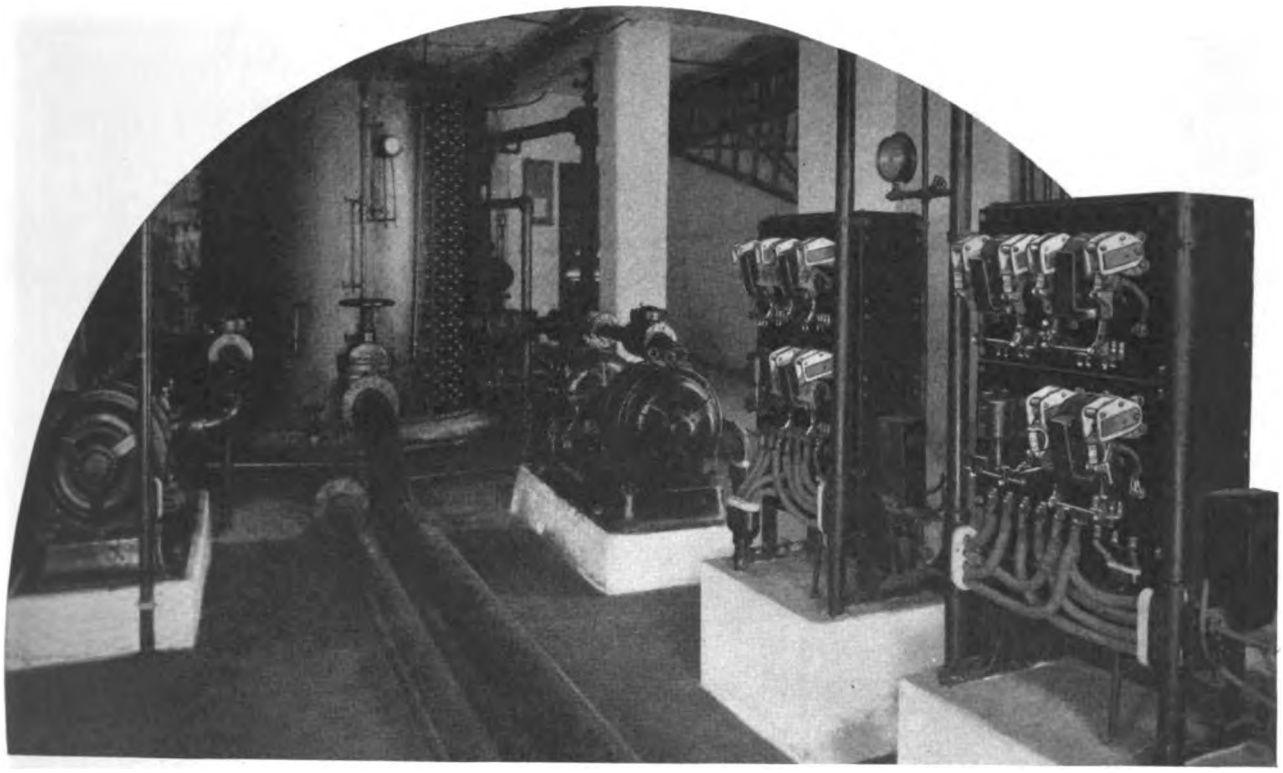
(2) The sender selector picks out an idle sender which immediately starts the "dial tone." This corresponds to the manual operator's familiar "number, please?" The person who is making the call, for example to PENnsylvania 5280, then proceeds to dial the number he wants beginning with the letters PEN and then the four numerals. The electrical impulses from the dialing are received by the sender.

(3) The sender causes the district selector to pick out an idle trunk to Pennsylvania after the letters PEN have been dialed. This trunk terminates on the district frame at Garfield and on an incoming selector at Pennsylvania. These operations correspond to several operations in the manual system whereby the girl at Garfield secures a trunk to Pennsylvania and connects the Garfield number to this trunk.

(4) After the first two numerals have been dialed the sender causes the incoming selector to pick out a trunk to the particular group of 500 lines in which the called number is located. One end of this trunk terminates on the incoming frame and the other end on a final selector.

(5) After the last two numerals are dialed the sender causes the final selector to pick out the called number. The bell then rings or, if the line is busy, the appropriate signal is given. The work done by the incoming and final selectors corresponds to that of the "B" operator in a manual office, who is a silent (so far as the public is concerned) factor in the completion of every call from one exchange to another.

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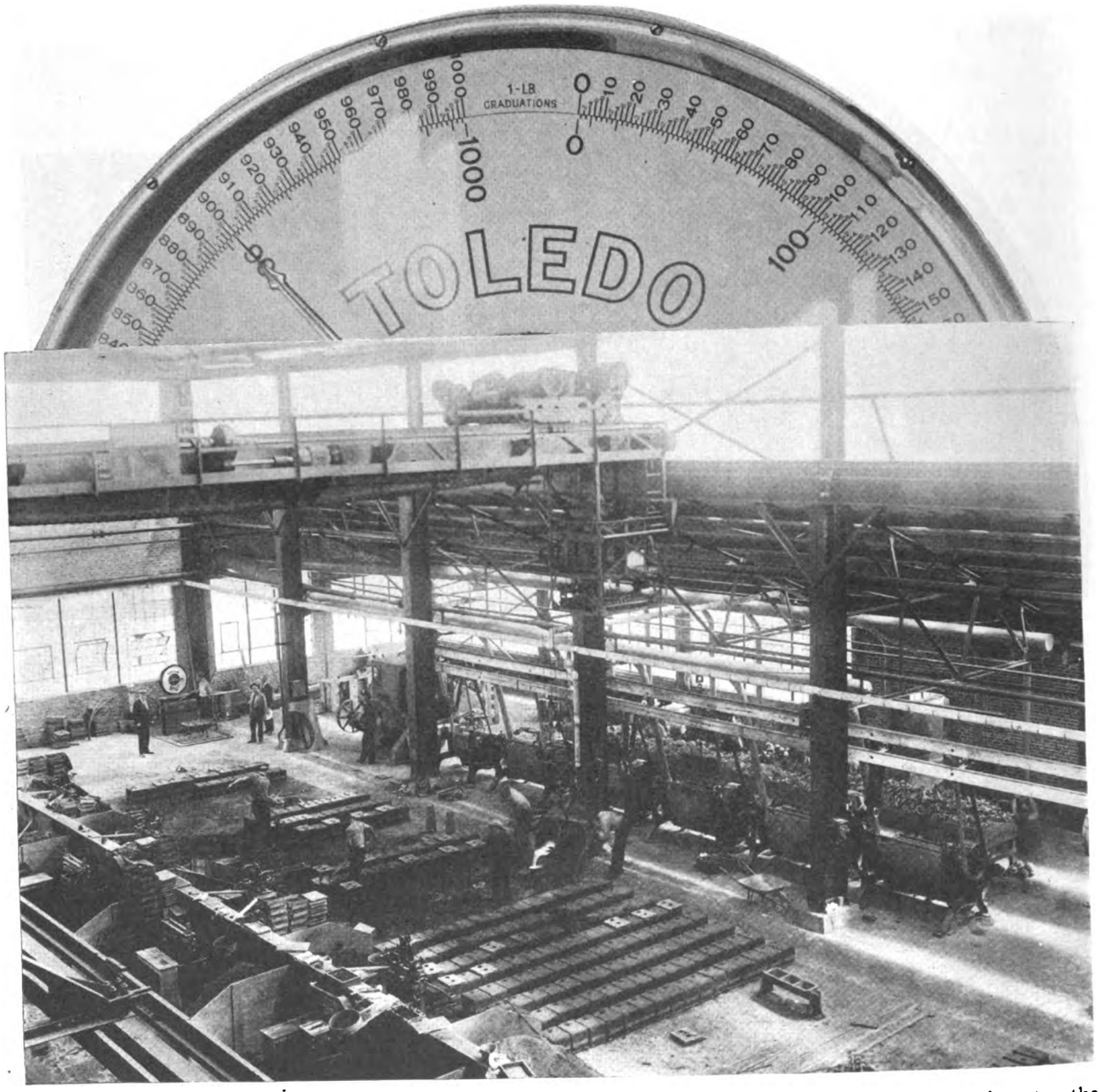
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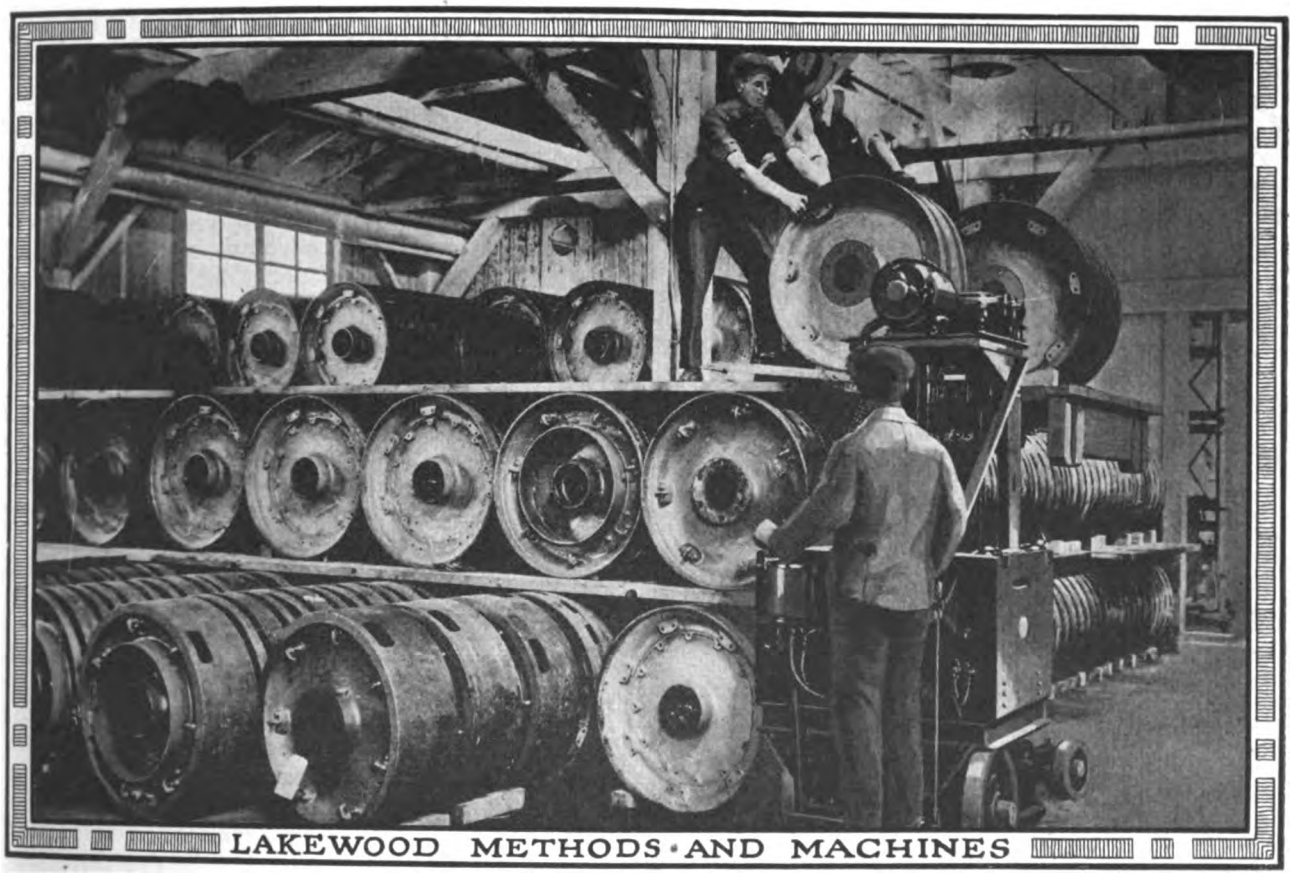
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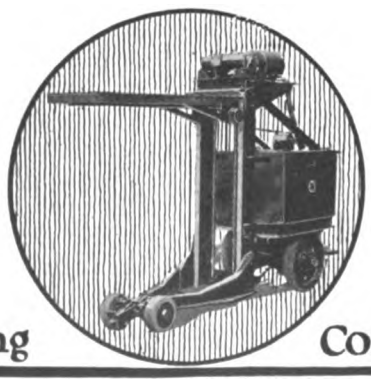
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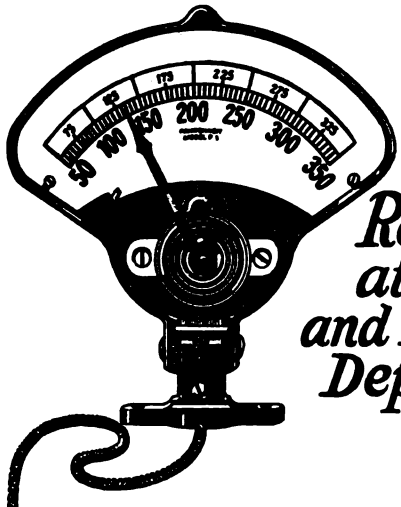
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The Application of Fuel Oil to Industrial Use

(*Continued from page* 15)

to coal, in many plants now burning oil, efficiency of the oil burning installation has suffered. This is particularly true in the case of the underfeed stoker, where furnaces so equipped have been converted. The importance of proper furnace volume cannot be overemphasized in turning to oil burning. The location of burners, in order to obtain the desired capacity and at the same time eliminate the possibility of damaged tubes or excessive temperatures in side walls, has much to do with the successful conversion.

In order to discuss the matter somewhat more specifically, I will call attention to the following illustrations of conversions. In each of these I have attempted to show the most economical and efficient method without intention to discriminate with regard to the class of equipment shown. There are many efficient oil burners on the market and no one of them fills the requirement of the entire field, each having its own particular advantages and application.

I have used the word "oil burner" and will continue to use the term although technically it is a misnomer. What is ordinarily understood as an oil burner is not an oil burner at all but rather an atomizer, carburetter or mixer wherein the oil is mixed with the requisite amount of the atomizing agent before projecting the mixture into the furnace.

Fig. 2 shows the return tubular boiler hand fired setting converted to oil firing, using steam as the atomizing agent. The bridge wall has been entirely removed with exception of the lower portion which is utilized to support the rear ends of the old grate bars, and the brick floor placed to the rear of the bridge wall. The space between the bridge wall and the rear of the setting has been filled with cinders up to the grate level, and a floor laid with the slope slightly upward as the rear wall is approached. The burner must, however, be set preferably level, or so that there will be no tendency for the particles of burning oil to impinge on the boiler heating surface. The air required for combustion is supplied through the checkerwork placed on the grate bars, the quantity being controlled by the ash pit doors or by draft controls.

Dry steam is a prerequisite of efficient operation of the steam atomizing oil burner. In the case cited, the steam is taken direct from the steam dome of the boiler, in which all water should be trapped out before the steam is allowed to go to the burner.

Fig. 3 shows how the Heine boiler is equipped with oil burning. As in the case with the return tubular setting of Fig. 2 the bridge wall is modified so that the floor of the setting takes the same angle as the drum and tubes, sloping to the rear. The burner is set in the front of the setting and in such manner that no burning particles will impinge on the tubes. The rear of the setting along the floor is given a slight fill to deflect the products of combustion upward towards the first pass.

In Fig. 4 is shown a Scotch Marine boiler equipped with steam atomizing burner. In the Scotch Marine boiler the grate is entirely removed and a very short grate substituted in order to provide greater combus-

(*Continued on page* 86)

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(*Continued from page* 84)

tion space. The forward end of this grate is supported on a low cross wall as shown. The grate is covered with a checkerwork of brick, and the air to complete combustion is drawn through the ash pit door and through this checkerwork.

Fig. 5 shows the steam atomizing burners applied to a B. & W. cross drum boiler of the marine type. Here again the floor of the setting is raised to conform to the rear end of the grate and the grate covered over with a checkerwork of brick. The first pass is located at the rear and the gases of combustion work forward in the second and third pass.

Fig. 6 shows the steam atomizing burner applied to the conventional water tube boiler. The grate surface is here also closed up with the exception of checkerwork for the purpose of admitting the requisite air of combustion. The rear end of the grate next to the bridge wall is filled to give an upward deflection to the gases of combustion.

The "back shot" method of oil burning has found considerable favor in steam plant work and the general method of its application is shown in Fig. 7. In this case the oil and steam pipes enter the setting through the ash pit doors and come up through the floor near the rear wall, or, in the case of the water tube boiler of Fig. 6, this point would be next to the bridge wall. Note that the checkerwork in the floor of the furnace in this latter case is to the rear, near the burner entrance. The front wall of the setting in this case is used as a target wall. This method is not adapted to the cross drum setting of Fig. 5, but will work very satisfactorily with any of the other settings shown.

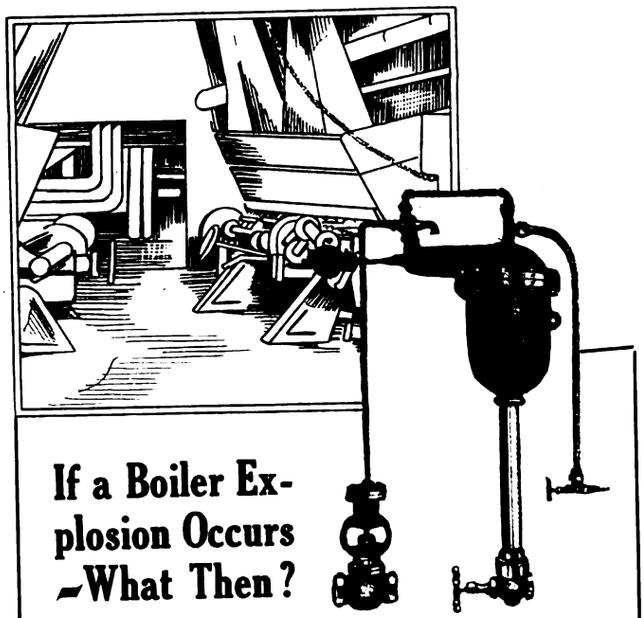
The working out of the checkerwork in order to provide sufficient air constitutes a point of considerable concern to many prospective oil burning enthusiasts, however, such need not be the case. The draft may be readily regulated by the damper control or the ash pit doors, therefore the width of opening and the number of openings in themselves are not so important as it may at first seem. The main thing to look out for is the gradual increase of the width of opening from the point nearest the burner. Nearest the burner the spaces may be made about 4½ inches wide, decreasing to 2½ inch width of air spaces for three or four rows of openings and then decreasing to 1½ inch openings for the balance. The checkerwork should cover at least two-thirds of the grate surface, using full width bricks between each row of openings.

Peep holes may be provided in the front of the setting, unless back shot methods are used; in which case the peep holes must be dispensed with because of the deteriorating action of the flame on the unprotected plate and brick edges. Peep holes are of very little value generally since flame indications are readily apparent in the ash pit and very little can be deduced from a direct view into the combustion chamber with regard to the working of the setting and boiler.

A complete oil burning installation consists of the following units: Storage reservoir; Circulating element; Atomizing agent; Heater and Strainer elements; and Burner.

In Fig. 8 is shown a complete system of storage, unloading depot, and boiler installation. The boiler is shown at (1), with the oil burner installed in the front

(*Continued on page* 91)



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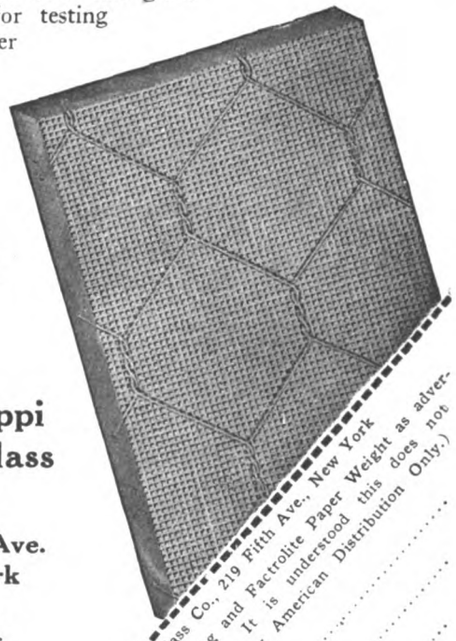
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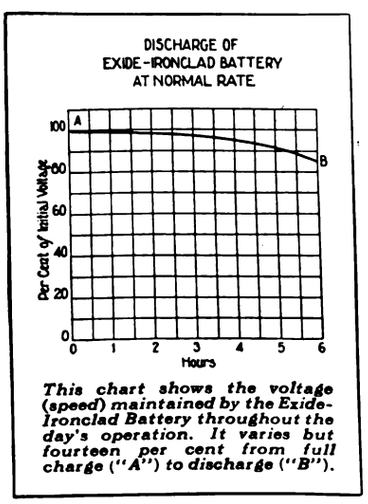
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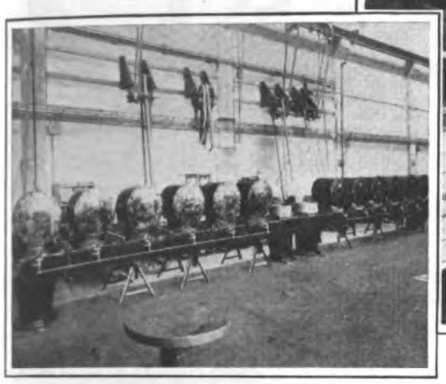


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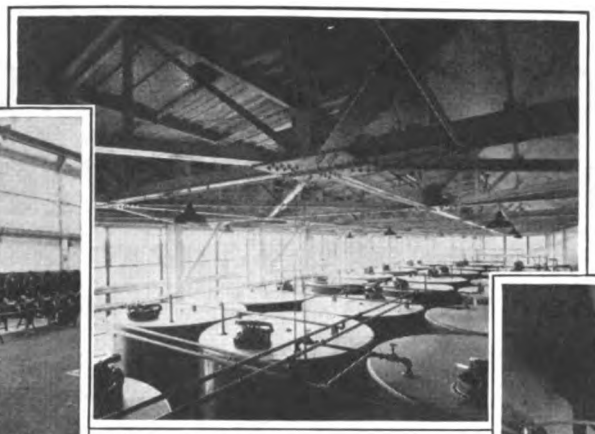
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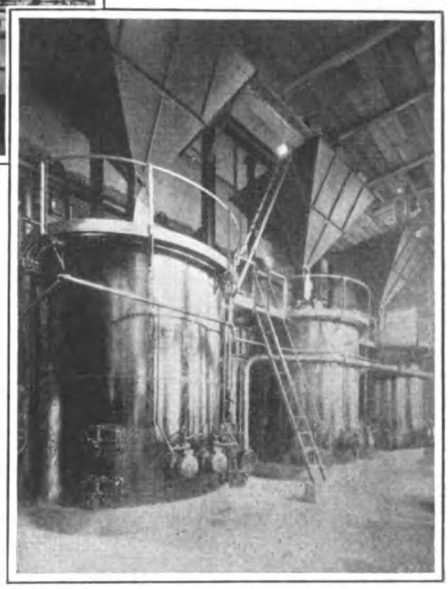
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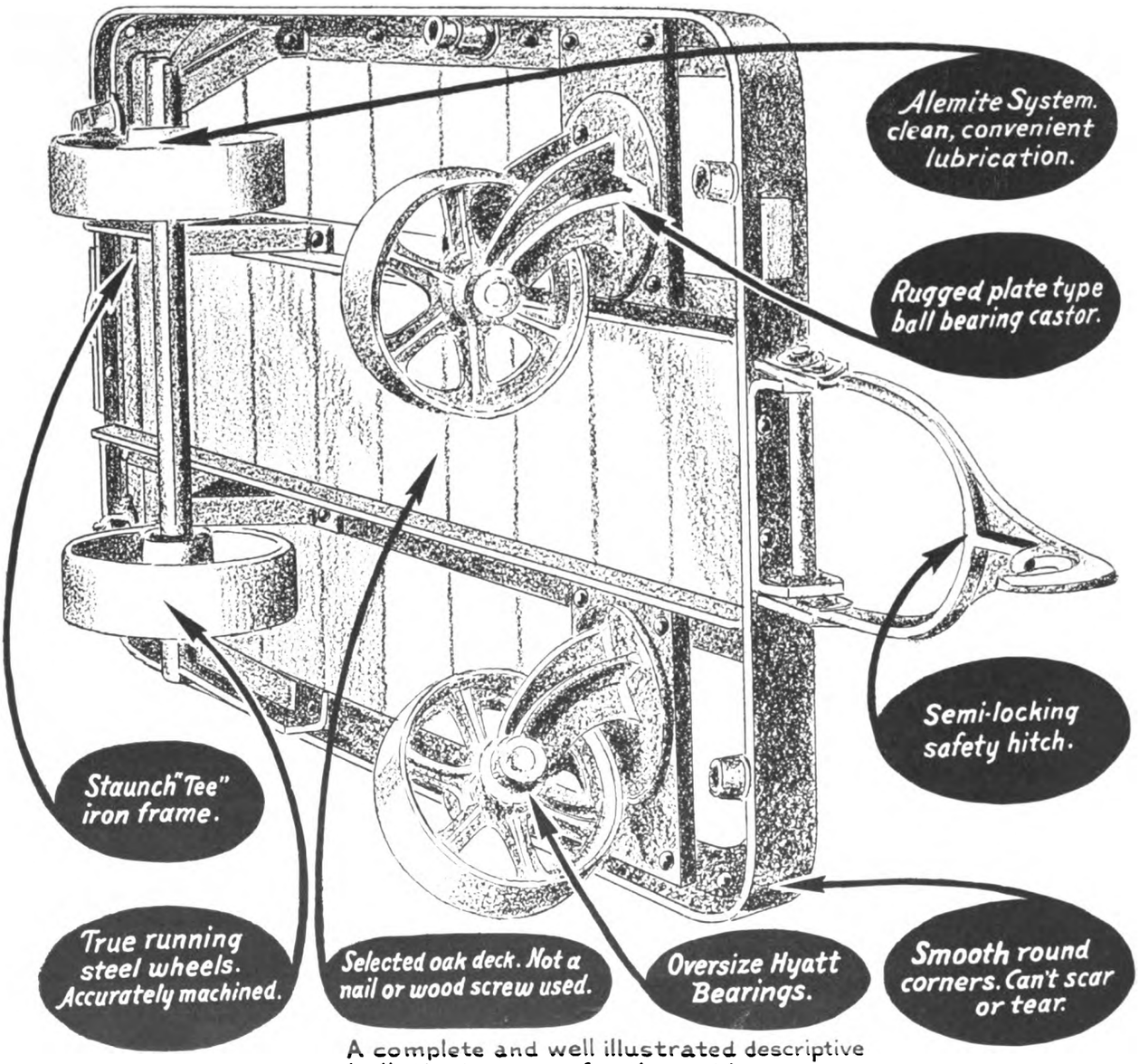
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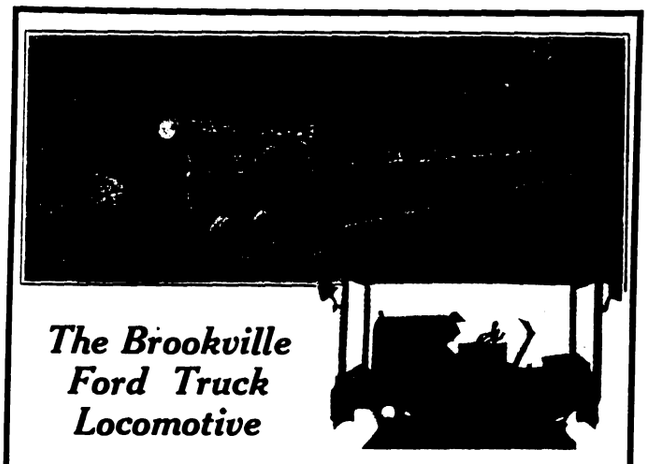
of the setting at (2), the steam for atomization is taken off the pump line at (3), the pump line (4) leads to the pump (5), and oil heater (6). The oil heater (6) also serves as a cushion reservoir which is necessary with all piston oil pumps in order to avoid excessive fluctuation of the burners with the pump working. A pressure regulator is shown (7), which is automatic, acting on the steam throttle of the pump through the governor (8). The oil reservoir (9) is supplied with a gage (10). An oil strainer (11) is inserted between the reservoir and pump to remove all foreign matter held in suspension in the oil that would tend to clog up the burners. Oil from the tank car (12) is unloaded direct to the reservoir through the flexible hose (13) and the strainer box (14). The strainer box (14) is provided to remove the heavy sludge, comparatively large pieces of foreign matter, etc., that may be contained in the oil car. The tank car is provided with steam connections utilized to heat the oil during cold weather before unloading can start.

Fig. 9 shows another installation, the chief difference from that shown in Fig. 8 being in the atomizing agent. In this case, air is utilized for atomizing the oil, the desired pressure being produced by the blower shown at (A). The air pipe (B) is shown leading to the burners (C) in the boiler; the air intake (D) being located on the outside of the building. The steam line (E) leading to the pump connects to the steam line on the boilers, not shown.

In these installations the oil reservoir is shown underground. In many States this is required by law. However, some States allow above-ground storage. The principal disadvantage of the above-ground storage is that in case of a break in the pipe lines the surplus oil will be drained out of the storage. Since it is generally necessary in any case to use a pump in order to obtain the necessary pressure on the oil to feed the burners there is very little gained in above-ground storage; in fact underground storage possesses so many advantages over the former that it is to be preferred.

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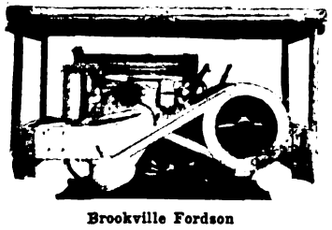
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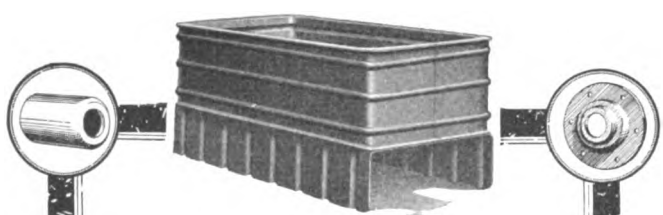
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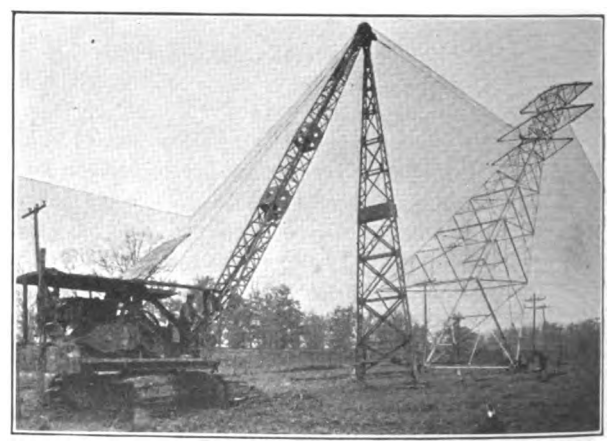
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Crawler crane re-rigged for use as an erecting machine.

is used. This shear-leg is equipped with telescopic legs which care for the unevenness of the ground, and ball and socket joints at the top take off strains.

In using this device the towers are built lying on the ground and in position for erection. A fall block and tackle are used with the crane and the hoisting cable is made fast to the top of the tower and by simply starting the hoisting engine on the crane the tower is pulled upright into position. All this is clearly shown in the illustration.

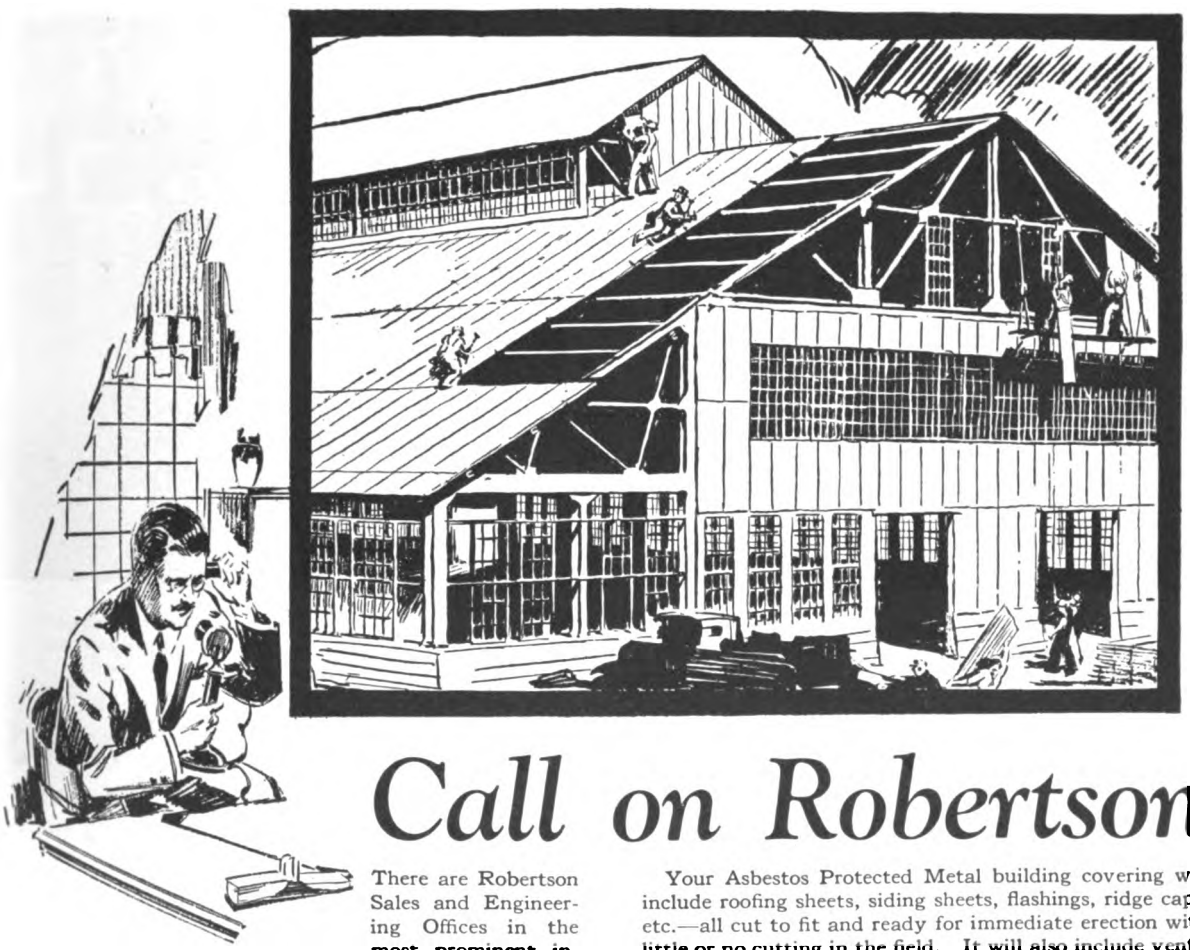
To facilitate the movement of this crawler crane from one tower to another for erection, a hold cable runs from one drum to the bottom of the shear-leg and is used to fold the shear-leg against the boom, where an automatic catch holds it while traveling.

This type of equipment has been found very efficient and was used with exceptional success by the Public Service Company of North Illinois for the erection of 90-foot transmission towers. On the first line erected, 288 towers were placed in seventy-five working days. However, many unforeseen obstacles were encountered. This rate is now being increased considerably and on future work it is expected the daily average will be ten towers a day.

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LOOK at any piece of Oneida Community silverware, and you will see a wonderful polish or satin finish of which this company is justly proud. Every precaution is taken to preserve this finish: the slightest marring or scratching of a piece is cause for rejection and loss.

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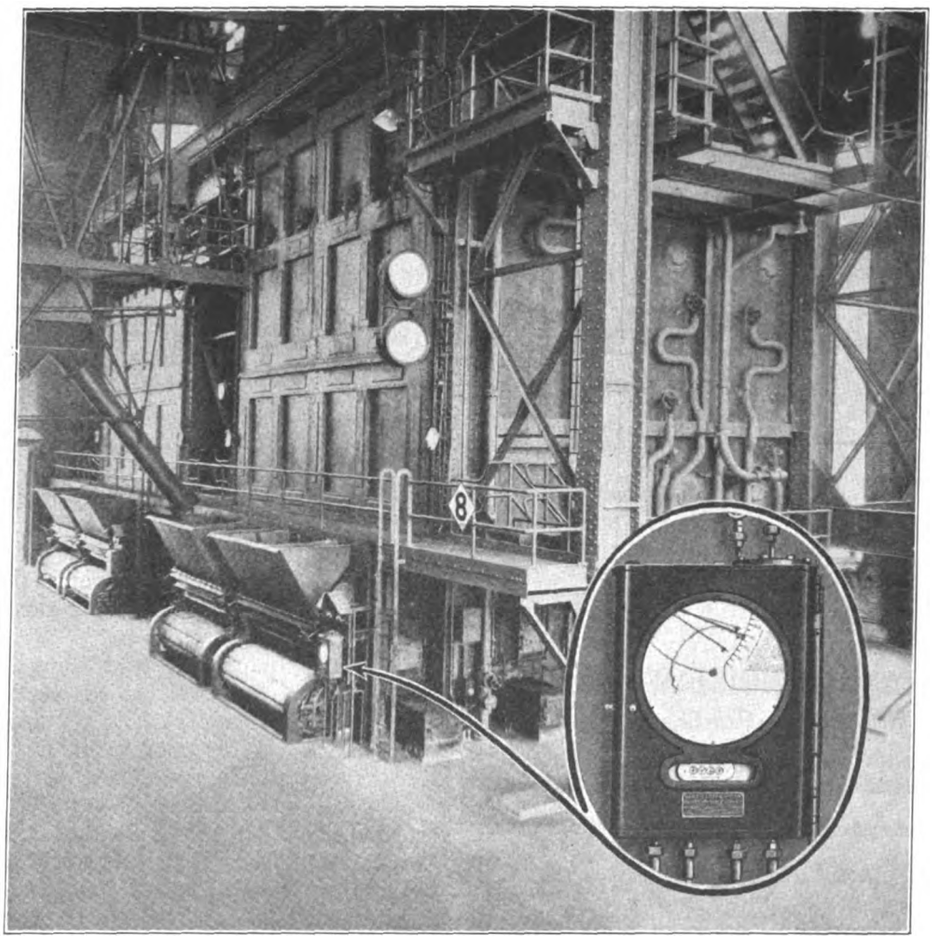
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Making Money "On the Side"

The Executive's Liability to His Employer

By Leslie Childs

THE question of the liability of a superintendent, general manager, or other high ranking industrial executive, to his employer for fees or profits "made on the side," in the course of his employment, is one of interest to executives in general. This is true because such executives frequently have opportunities of earning fees or profits from ventures, somewhat outside the scope of their duties, which if permissible may add substantially to such an officer's income.

Of course each case of this kind must necessarily be governed by the particular facts involved, and for this reason the subject cannot be covered by the statement of a hard and fast rule. However, generally speaking, the courts look askant upon profits made by executives in situations of this kind, unless it is clear beyond doubt that in making them the executive has not violated either his contract with his employer, nor sacrificed the latter's interests in any manner.

If then it is found that the executive, in making "side money," as it is commonly called, has either violated his contract with his employer, or sacrificed the latter's interests in any way, the courts will, as a general rule, declare the executive liable to his employer for the amount of the profits so made. In other words, in a situation of this kind, by the weight of authority, such profits will be declared the property of the employer, and the officer making them will be compelled to account for them upon a proper showing.

A Violation of Contract

The application of this rule of law is illustrated in a most striking and interesting manner in the Michigan case of Michigan Crown Fender Company vs. Welch, 178 N. W. 684. The facts and circumstances which culminated in the action, in so far as material to this discussion, were as follows:

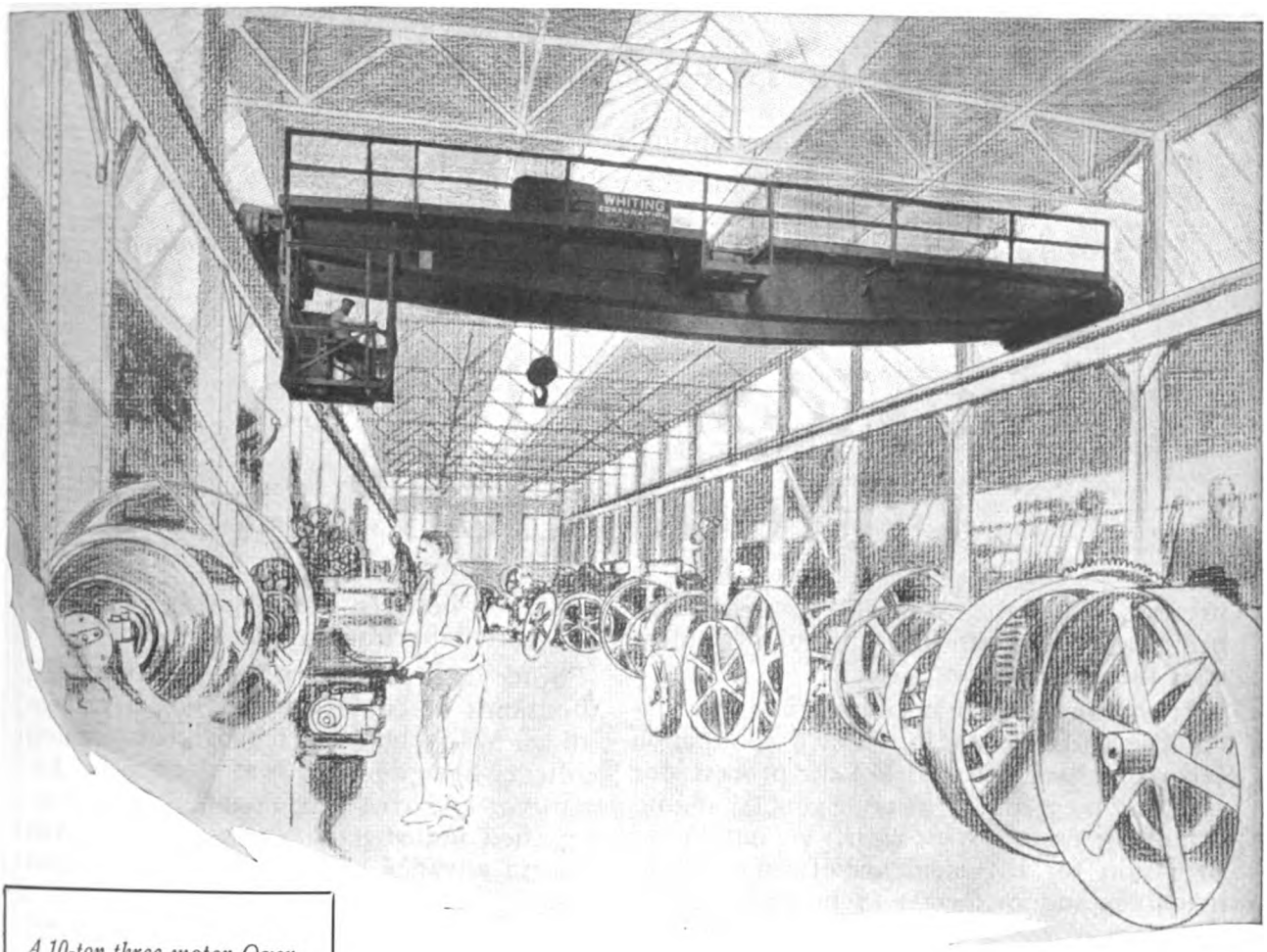
The Michigan Crown Fender Company was engaged in the manufacture of fenders, hoods, running boards, and other sheet metal parts for automobiles, and employed Welch, a mechanical and productional engineer of great experience, as its general manager for a period of five years. Welch was, in addition, made a director of the corporation, and appears to have had complete charge of the buying as well as the production end of the company's business. The contract of employment was reduced to writing and, among other things, provided as follows:

"The second party (Welch) agrees to devote all his time to the interests of and for the benefit of the first party for the full period of five years . . . and not to engage in any other business during said period which would in any way conflict with his duties to the first party, the first party to be the judge in the matter."

Welch entered upon the contract, and some time thereafter the company took a contract to supply the Republic Motor Truck Company with auto parts which required

(*Continued on page* 100)

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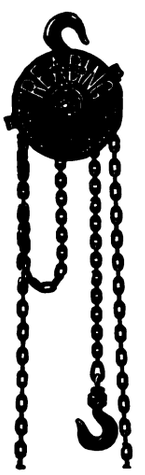
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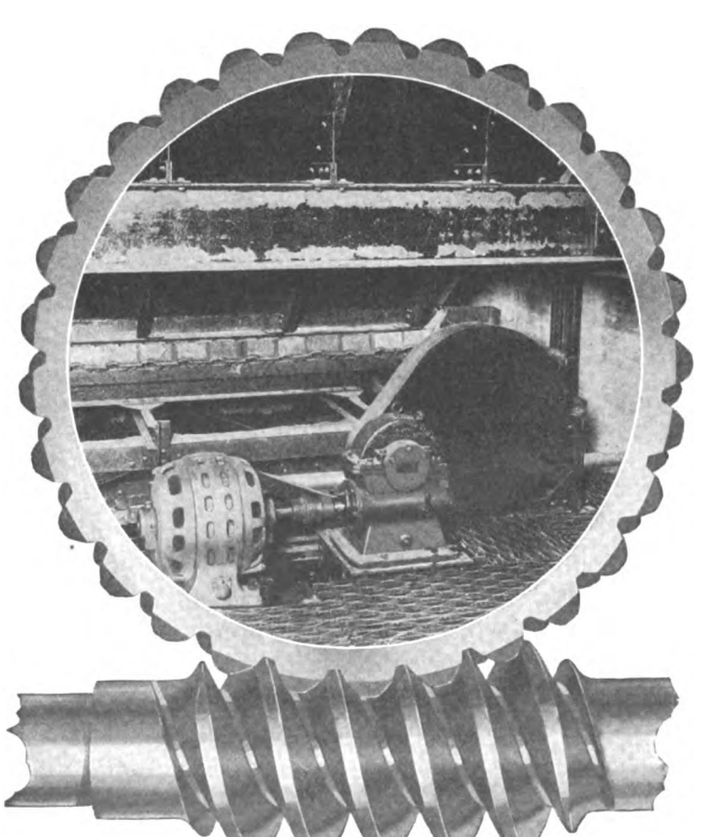
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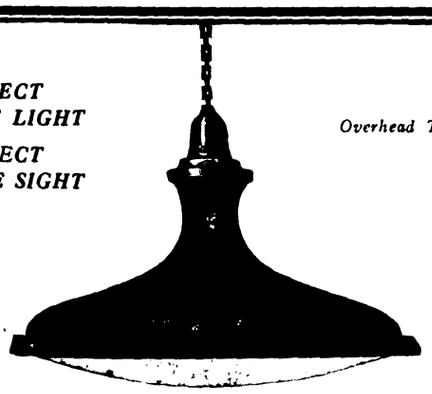
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(*Continued from page 96*)

over $800,000 worth of material. It being the duty of Welch to purchase this material, he informed the company's directors that they would require among other things 200 tons of 20-gauge steel, and he was instructed to purchase same.

Some difficulty was experienced in finding the quantity of the steel mentioned, but finally Welch ascertained that the Troy Manufacturing Company had a supply of 700 tons of 20 and 22 gauge steel which it would sell. The Troy Company, however, declined to split the lot and let Welch have the amount required by his company. Welch thereupon purchased the entire lot, retained what his company needed, and resold the balance to the Ford and Cadillac companies on his own account. This was done, it appears, without the knowledge or consent of his company and netted him a profit of over $5,000. All right.

Ethics and the Law

Thereafter the directors of Welch's company obtained information relative to this transaction and demanded an explanation of it. Welch declined to go into the matter, taking the position that he was within his rights in making the extra profits on his own account.

Upon the trial of the cause in the lower court, the company was awarded a judgment. From this judgment an appeal was taken to the Michigan Supreme Court where in passing upon the right of the company to the profits made by Welch, on his own account without the knowledge or consent of his employer, it was, among other things, said:

Secret Profits Held Property of Company

"Defendant (Welch) was not only in the service of plaintiff (Michigan Crown Fender Company), employed as its general manager, one of his duties as its agent being to purchase steel for its use, but he was also a director and officer of the corporation. It was his duty to make the best bargain possible for his company. By the terms of his contract of hiring he expressly agreed to 'devote all his time to the interests of and for the benefit of' plaintiff, and while in its service 'not to engage in any other business . . . which would in any way conflict with his duties' to it, as to which matter plaintiff was 'to be the judge.' In the Troy steel transaction where he admittedly made a profit of over $5,000, he assumed to be the judge of whether his interests conflicted with his duties, refused to discuss the question with plaintiff's directors, and told them it was none of their business.

"But independent of the express terms of his hiring, as to engaging in other business, it is an elemental rule of agency that his duties required his efforts and activities in the line of his employment should be for the benefit of his principal, and he was not at liberty to deal in the business of his agency for his own benefit. It was his duty to communicate to his principal facts relating to the business, which ought in good faith to be made known to the latter. . . .

"Where the agent is also an officer of a corporation for which he is acting, there is added reason for rigidly adhering to the rule. . . . The trial court rightfully decided that defendant's discharge was justified, and the conceded profits made by him in the Troy deal were made in connection with and in execution of his agency, and belong to the plaintiff. . . ."

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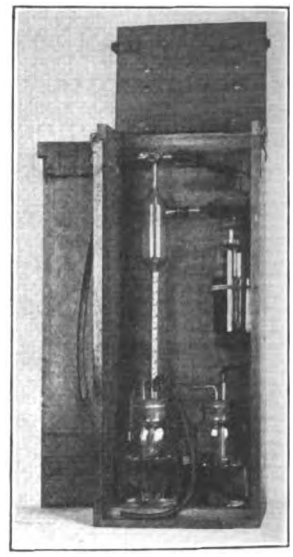


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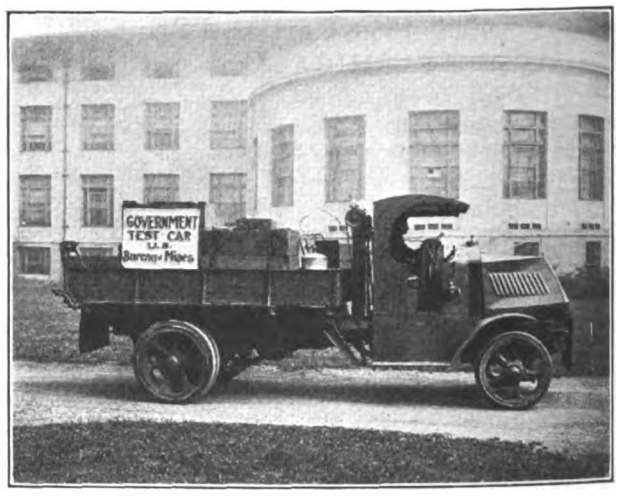
Saving Automobile Gasoline

By M. E. Clements

BY analyzing the exhaust gases from automobile engines, chemists of the Federal Bureau of Mines have been able to so adjust the carburetors as to obtain increased mileage and considerable savings of gasoline. Tests made by the Bureau on fifteen big coal trucks operated by the Government Fuel Yards, in Washington, D. C., resulted in an increased mileage amounting to 22 per cent. with the same consumption of gasoline. On but one of the fifteen motor trucks tested was the carburetor found to be already adjusted to give the best results possible with the fuel being consumed. The Bureau estimates that the average motor vehicle wastes thirty per cent. of the heat value of the fuel used.

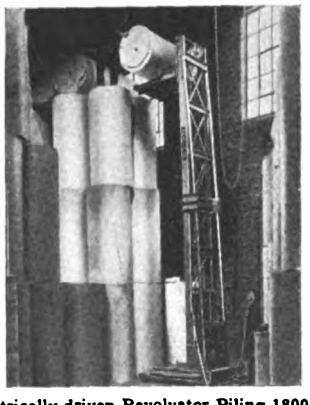


Test car of the Bureau of Mines, and the test apparatus.



The theory on which the Government experts worked is that the percentage of carbon dioxide in the exhaust gas indicates the ratio of air and fuel going into the engine and the degree of completeness of combustion of the fuel used. In analyzing the exhaust gases, use was made of a specially constructed instrument known as a portable carbon dioxide indicator which absorbs and measures the carbon dioxide in samples of gas taken from a hole drilled in the exhaust pipe. After ascertaining the percentage of carbon dioxide in the exhaust gases, the carburetor may be adjusted so as to remedy any defect or excess of air and fuel.

It is considered that the indicators will be almost indispensable to concerns having ten or more large motor trucks in service, affording the opportunity to make large savings of gasoline.



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and pile your goods in the modern way. The Revolvator is built in nine standard models of any practical height, any practical width, any practical capacity for hand operation, motor drive or combination hand and motor operation. The Revolvator is the only portable elevator furnished with a revolvable base permitting its use in confined spaces.

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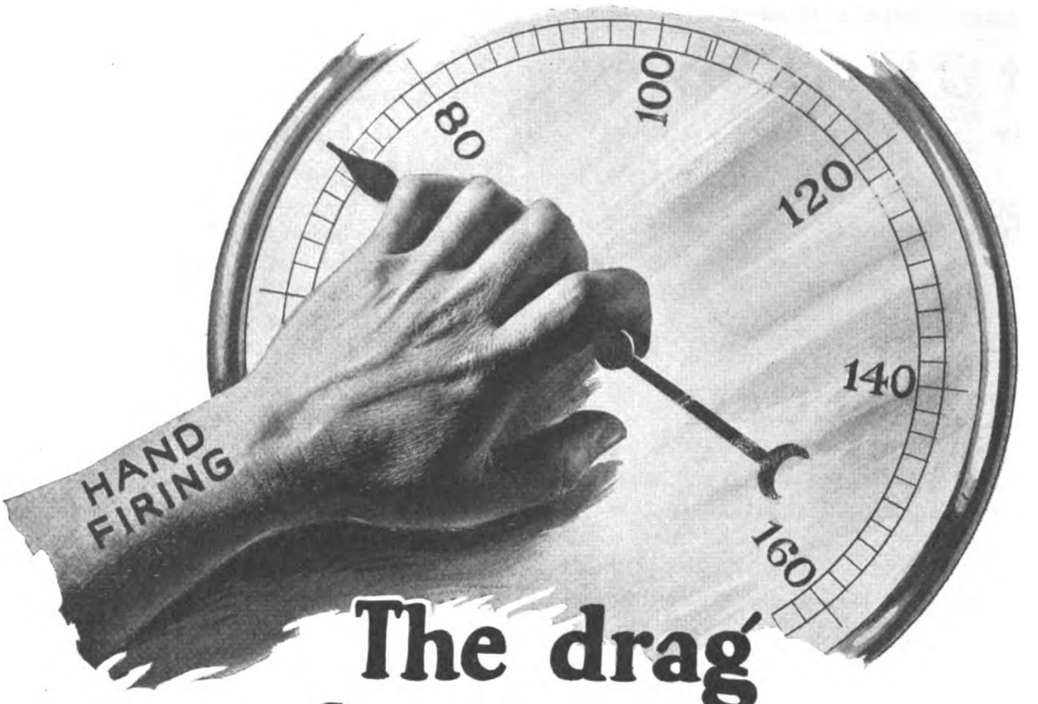
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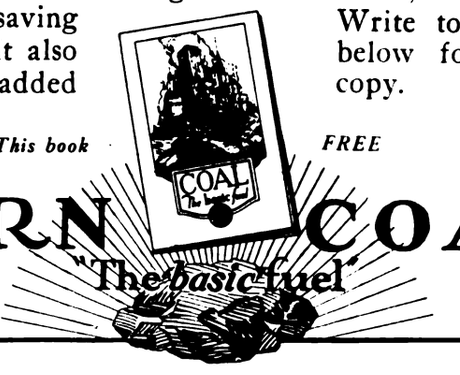
More hand fired boilers can be installed: more bedlam in the boiler room; more waste of coal and money—*or* mechanical stokers can be installed to wipe out the whole problem.

The latter course not only replaces the confusion of hand firing with smooth running labor and fuel saving equipment, but it also provides greatly added boiler capacity that often makes the installation of additional boilers unnecessary. In this case the first cost of the stoker installation is offset by the saving in boiler equipment.

By providing for any possible steam demand, by cutting boiler room labor costs, and by burning a lower grade of coal at the highest possible efficiency, mechanical stokers will pay you a dividend that is unsurpassed by any other equipment selling at any price.

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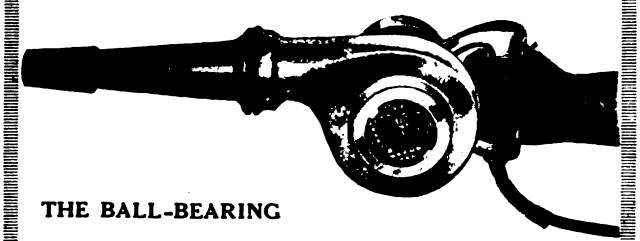
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Personnel Work in Hard Times

By M. S. Rossy

Personnel Manager, John A. Dunn Co., Gardner, Mass.

WHEN the morning mail is light and orders are either insignificant or non-apparent, the time has come for a most careful scrutiny of the overhead of a business with the view of reducing expenses. Everything that is not directly concerned with production must be analyzed; if its service does not balance its cost, it should not remain as a hindrance to the progress of the concern.

Prosperity brings problems of employment that a business depression dispels. When jobs are many and employment assured, the different industries must vie with each other in their efforts to secure sufficient employees. The concern that can offer the best inducements wins the job seeker. For this reason, Personnel Departments, or Service Departments, became popular a few years ago, being an effective means of advertising the concern. However, in hard times, such an advertisement is of no benefit; it merely adds to the work of a more or less reduced force in the Employment Office. The Personnel Department then becomes apparently a great expense, a luxury of business. Should it be discontinued altogether, or reduce its functions, or remain intact as an emblem of the humanitarian instincts of the chief executives?

Let us deal with the last view first. Decidedly, the Department should not remain as it was; business must be maintained and unnecessary expenses of overhead must be cut. In justice to the worker, the factory must be kept running as long as possible; naturally, his daily wages are of the most importance to him. He does not appreciate a present that he has to pay for, after all. The factory managers who give to their employees in one way and take from them in another are criticized more than applauded, and the good that they have hoped to accomplish does not materialize.

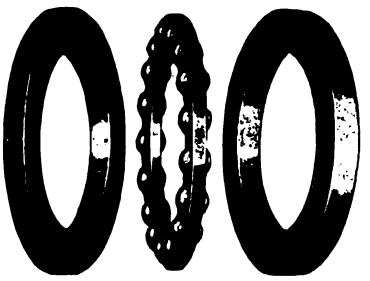
Meeting Changed Conditions

If the Personnel Department, then, must suffer an alteration, should it become merely a memory or still function in a much reduced capacity? There are three reasons why it should not be dropped absolutely. First, it helps to bridge the gap between the employers and the employees: it is able to maintain the desired equilibrium between those two widely different classes. Secondly, it can aid the workers to keep a cheerful mental attitude during a period of perplexity and difficulty. Lastly, it is ready to come to the assistance of the industry when the pendulum swings forward again and the business boom commences. The Personnel Department should be so revised that the small expense involved is more than balanced by the service rendered.

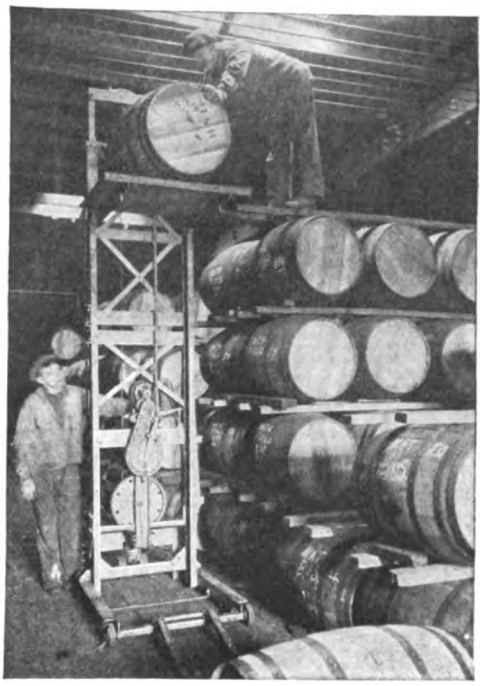
To begin with, it is very important that the management keep in touch with the workers and learn their point of view. When better times come, there is less probability of a labor shortage in a particular plant, if the management has maintained close contact with the employees throughout the period of depression and has offered them sympathy and advice.

(*Continued on page* 108)

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FAFNIR 1800 Series THRUST BALL BEARING used in clutch of Model K. Motor Attachment of the REVOLVATOR.



REVOLVATOR, manufactured by the Revolvator Co., 336 Garfield Ave., Jersey City, N. J., with FAFNIR THRUST BEARING in clutch of motor attachment.

Ball Bearings Give Rapid Operation to Clutch of Motor Driven Portable Elevator

The clutch of a motor driven elevator like the one above must be able to stand up under all abuses that constant handling of heavy loads can offer. At the same time it must work rapidly and easily at the contact of the clutch lever.

The FAFNIR THRUST BALL BEARING in the disc clutch of the Model K REVOLVATOR, motor attachment, permits the multiple discs to be held rigidly together, eliminating friction which would be caused by clutch pressure lever.

The Revolvator people have converted hand operated tiering machines of many types into a combination of motor and hand drive containing this clutch to the full satisfaction of users. They write—"Since adopting your THRUST BEARING our Model K electric attachment has been a pronounced success."

THE FAFNIR BEARING COMPANY

DETROIT **NEW BRITAIN, CONN.** **CHICAGO**

Makers of high grade ball bearings—the most complete line of types and sizes in America

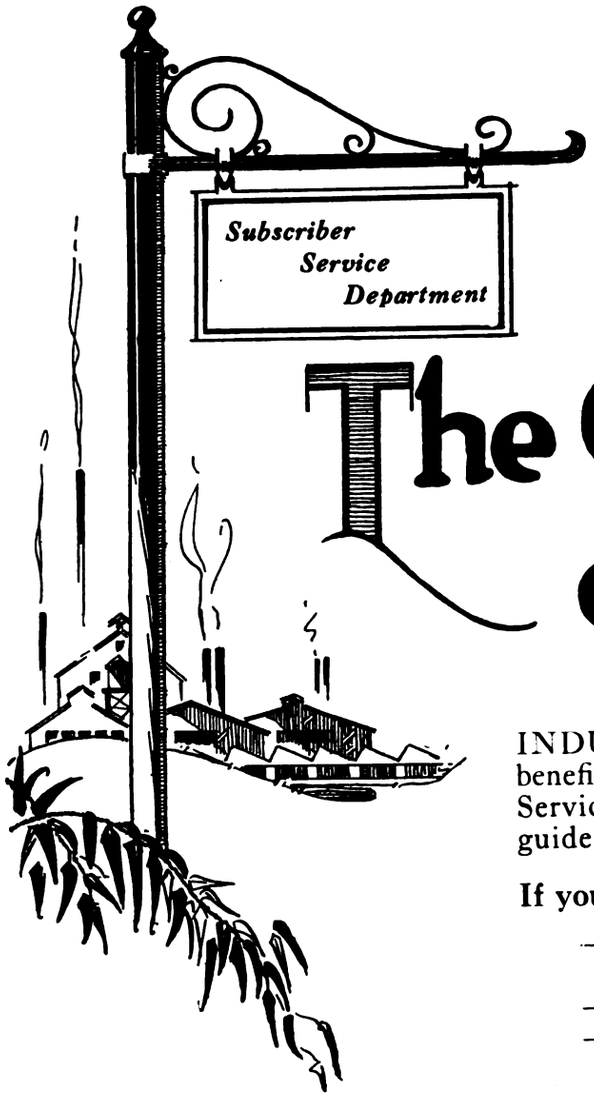


FAFNIR

BALL BEARINGS

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The Guide Post of Industry-

INDUSTRY ILLUSTRATED maintains for the benefit of every managing executive, a Subscriber Service Department whose function it is to serve as a guide to the correct solution of management problems.

If you want to know

—previous industrial experience on any problem;
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EUCLID

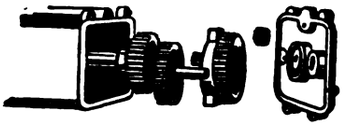
CRANES HOISTS

"RAISE PROFITS"

"The Finest Thing in Our Plant!"

EUCLID for PERMANENT PERFORMANCE

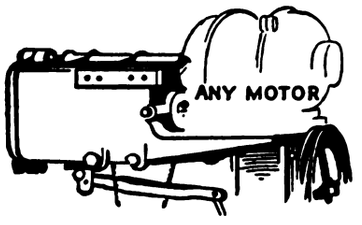
SIMPLE



3 Big Spur Gears.
No delicate parts.
Skilled mechanic not required.
Disassembled without removing hoist.

SAFE

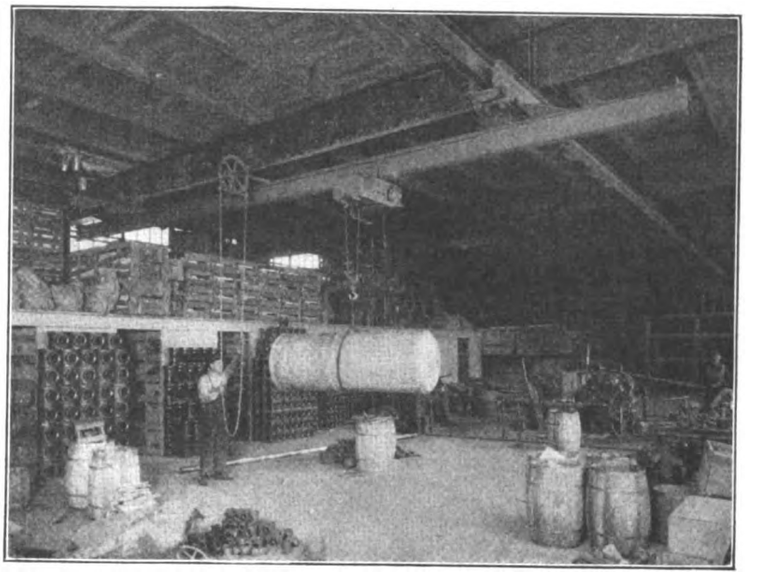
All gears wide face—coarse pitch.
Frame one piece—accurate alignment.
Dependable factor of safety.
Unfailing brakes and limit switches.



STANDARD

Any motor fits a Euclid.
Parts enclosed in oil bath.
All parts to jig—interchangeable.

LOW HEAD ROOM
ACCURATE CONTROL



The best advertisement of any product is a thoroughly satisfied user.

We believe the public is more interested in what our customers say about EUCLID equipment than in what we say. Voluntary praise from EUCLID users has more weight than any amount of cleverly worded statements unsupported by proof.

Therefore we shall continue to build honest, sturdy cranes and hoists—the best you can buy—and let our customers furnish our advertising.

A large plumbing establishment** (name on request) **writes:

"To say that any one piece of equipment is the finest thing we ever had in our plant is a pretty strong statement—but that is exactly how we feel toward the EUCLID crane installed about two years ago.

"We are in the plumbing business, and we handle pipe, radiators, bath tubs, etc. Our EUCLID crane is used for loading and unloading wagons and trucks and lowering equipment between main and mezzanine floors. With this one ton crane we handle bulky and clumsy equipment as well as that weighing over a ton with greatest ease.

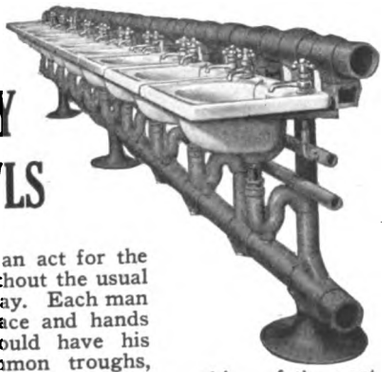
"When deciding upon which crane we would purchase, *a survey of present users convinced us of the superiority of EUCLID cranes.* In two years' steady use we have hade no mechanical trouble and have not spent a penny for repairs."

THE EUCLID CRANE & HOIST COMPANY

EUCLID, OHIO

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MEECO SANITARY WASHBOWLS



WASHING is an act for the individual without the usual element of team play. Each man washes his own face and hands and therefore should have his own water. Common troughs, sinks and similar devices should be a thing of the past.

That is why leading manufacturers are rejecting unsanitary washing devices and are equipping their plants with MEECO INDIVIDUAL SANITARY WASHBOWLS.

They are adaptable to small or large space. Their construction offers greatest economy in conserving water. The porcelain enameled bowls—the sturdy cast iron frame—combine sanitation and durability. You can order these bowls in batteries of any number to fit your space.

Meeco individual washbowls are in 5000 factories representing 200 industries, and this list is growing daily. Why not investigate?

Illustrated catalog on request

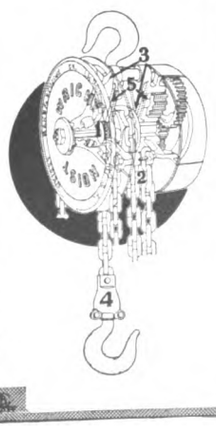
Lockers, Partitions
Chairs and Stools

METAL MEECO PRODUCTS

Shelving, Boxes
Drinking Fountains

MFG. EQUIPMENT & ENGINEERING CO.
FRAMINGHAM, MASS.

RAISE IT WRIGHT



No matter what your lifting problems may be, there is a *Wright Super-hoist* for doing that particular job cheaper, safer and quicker. It's an unusual hoist with many exclusive and superior features in construction. Ask us for details.

WRIGHT

LISBON, OHIO

(*Continued from page* 104)

On the other hand, it is well for the employees to learn something about the industry that employs them. They work harder and more willingly if they have some understanding of the problems faced by the concern.

An order for three hundred dozen chairs was once cancelled after the first crates had been shipped. One of the employees of the factory said: "After we rushed so on those seats, it is a shame for that order to be cancelled. What a blow it must have been to Mr. S—! I don't think that the wood was properly dried and we ought to be able to do it better. I am going to spend a little time nights thinking about it and see if we can't turn out better seats next time."

The Value of Understanding

If the workers understand the difficulties of conducting a business in a period of depression, they will accept misfortunes more stoically than one might at first believe. It is a good investment to spend time and effort in encouraging a cheerful frame of mind among the employees when conditions give little promise of early improvement. That investment pays when they say such things as these:

"We've got a ten per cent. wage cut now. It sure is hard, but we are lucky to get any money at all. Lots of factories are shutting down, but this cut ought to keep things going for a little while."

"Thirty girls were laid off in the Inspecting Room last night, and what do you think? They didn't lay off one woman with any children to support! They haven't orders enough to give us all work, and they know that it is easier for us young girls to loaf than it is for any one with kiddies."

"Albert Martin was laid off last night and he has worked for this factory eight years! It seems tough, but he isn't kicking. Miss S— found another job for him in the new hotel and he is going to start on it tomorrow. When things are better, he'll be back, all right."

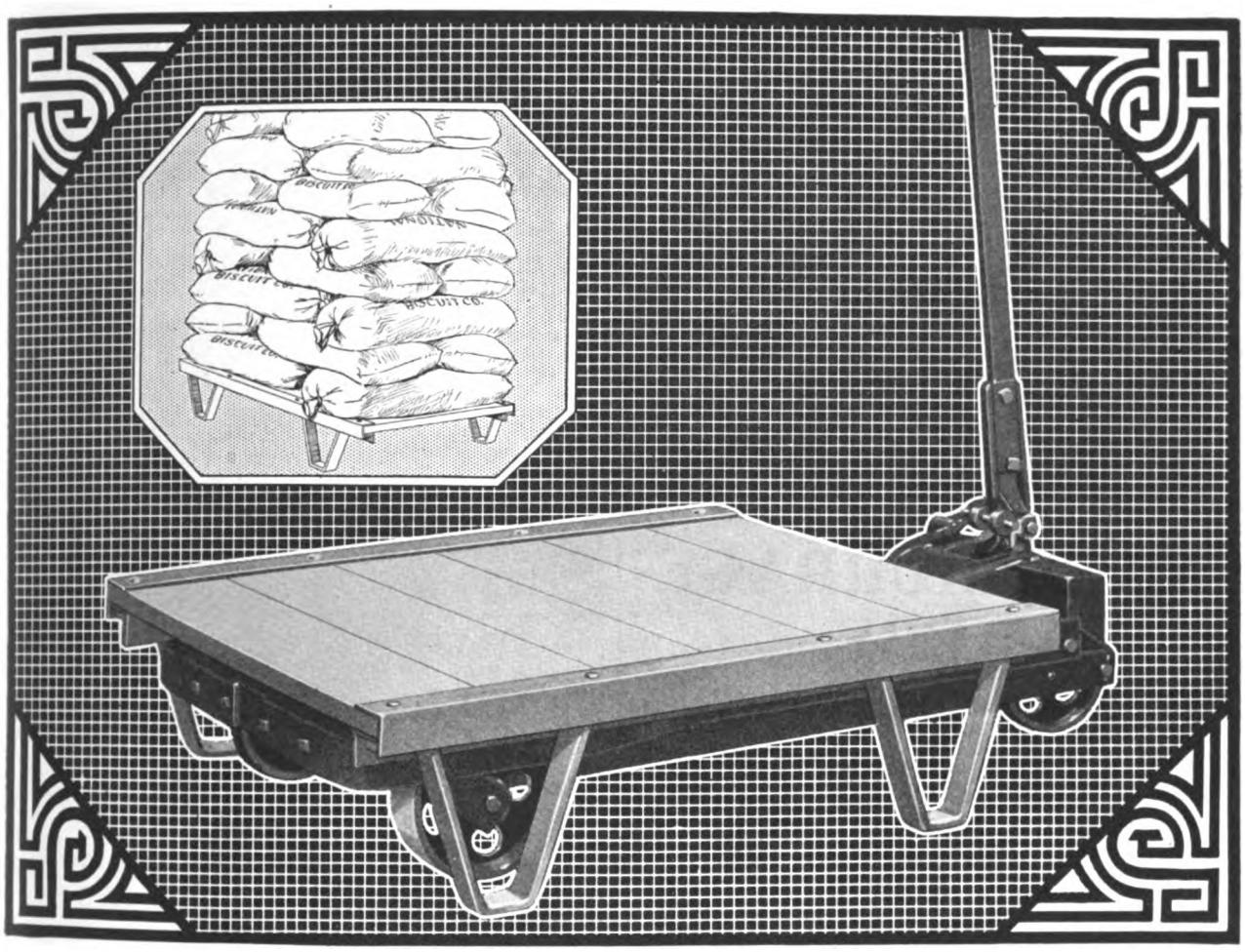
Preparing for Better Times

When a factory releases workers, it would like to have many of them back again later. The person released must understand that his dismissal has become a matter of necessity and is a cause of regret. If another job can be secured for him outside, his loyalty is assured. At any rate, an attempt to explain the matter to him is appreciated and may lead to his return when increasing orders produce more opportunities for work.

When the business boom is started and the factory begins to refill its depopulated ranks, the Personnel Department is ready to call back the desired workers. The list of addresses is available and the employees can be quickly summoned to resume work. After seeking first those who were formerly employed in that industry, the Personnel Department can consult its list of new applicants. The "early bird" adage is as true here as elsewhere.

The Personnel Department usually has many functions, the chief being restaurant, plant paper, athletics, recreation, employment, and personal supervision. In hard times, everything that is not self-supporting may be dropped,—and the employees will understand and approve. Yet employment and personal supervision should be maintained,—at a reduced cost, of course. There will be little hiring done in hard times, but "firing" deserves as much attention as hiring, for those "fired" today may be wanted when the hiring starts tomorrow.

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When it stands on this sturdy platform your business has a sure foundation

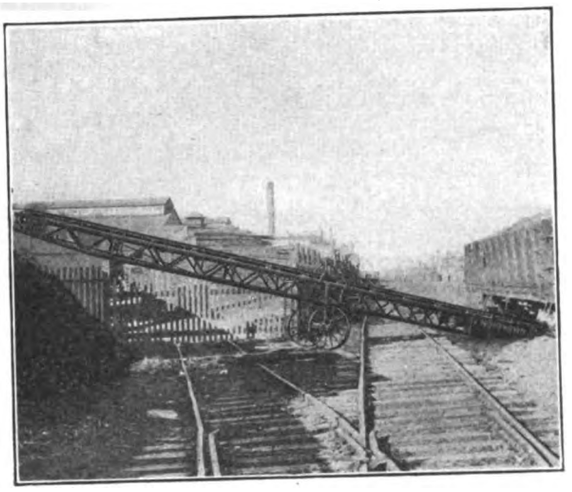
In one month National Biscuit Company bought 600 Stuebing Steel Bound Platforms and thereby made a surprising cut in the cost of storing and handling stock. Because they are built of selected oak, with legs and bolts of forged steel, and are Steel Bound the full length, these platforms cost virtually nothing to maintain through long years of thrifty and resultful service. When used with Stuebing Lift Trucks, they convert masses of inert material into live factors of a fast-moving program. That's why they are standard equipment for great freight terminals and many of America's most successful industries. Send for illustrated catalogue. The Stuebing Truck Company, Cincinnati, Ohio; and Cornwall, Ontario. Branch sales offices in all principal cities.

StueBing

LIFT TRUCK SYSTEMS

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NO DEMURRAGE HERE

FIFTY tons of coal unloaded in just 2 hours and 5 minutes—that's getting the best of Old Man Demurrage! The Elkhorn Lumber Company, Elkhorn, Wis., is doing this daily with their 22 ft. Northern Conveyor.

Note the low down hopper which permits the Northern to be pushed far enough under drop bottom cars to unload them from below, quick and easy.

Handling loose material—coal, coke, ashes, sand, ore, shavings, chemical substances can be done cheap and fast with a Northern Portable Conveyor. Most any kind of material that can be shoveled can be handled by the Northern at a cost of less than ten cents per ton. And it's easy to move it about the plant as needed; unload a car of coal at one point, then wheel it into action at the ash heap or storage pile.

Send for Bulletin

giving interesting facts about the use of a Northern Portable Conveyor at the industrial plant.

NORTHERN CONVEYOR & MFG. CO

32nd and Auer Aves.

MILWAUKEE WIS.



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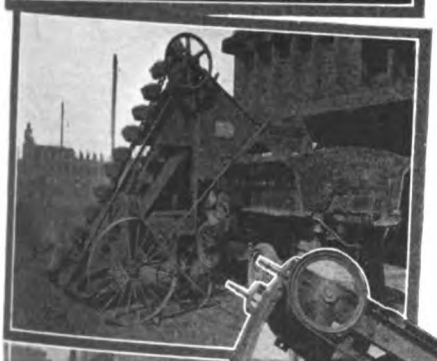
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You too can use a Link-Belt Portable Loader to Advantage

"WITHIN six months," writes one user, "the savings effected with the Link-Belt Portable Loader paid its cost. It is now returning us 197% every year on the investment."

"Link-Belt Portable Loaders enable us to load from under tracks and trestles, and to move coal from points which would be utterly impossible with other machines," reports another user.

"It is efficient and economical. Maintenance expense has been nil, and we see no immediate need for any," is the report of still another satisfied user.

All attest the unusual ruggedness, easy mobility, large capacity, speed, and ability to handle coal of all sizes—outstanding features which lead us to believe that *you too* can use a Link-Belt Portable Loader to advantage. Write for *full* particulars. Address the nearest Link-Belt office listed below.



2110

LINK-BELT COMPANY

Leading manufacturers of Elevating, Conveying and Power Transmission Chains and Machinery

PHILADELPHIA, 2045 Hunting Park Ave. CHICAGO 300 W. Pershing Road INDIANAPOLIS, 200 S. Belmont Ave.

LINK-BELT

50 THIS YEAR LINK-BELT IS FIFTY YEARS OLD

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A REX Economy Elevator that was delivered in 8 days

A paper company in the northwest needed an elevator, 33′-6″ on centers, to handle hot ash. The delivery date offered on the inquiry was 4-5 weeks. This time was too long. It was demonstrated to this customer that a Rex Economy Elevator would fit the requirements.

Date of order:
9/11/24

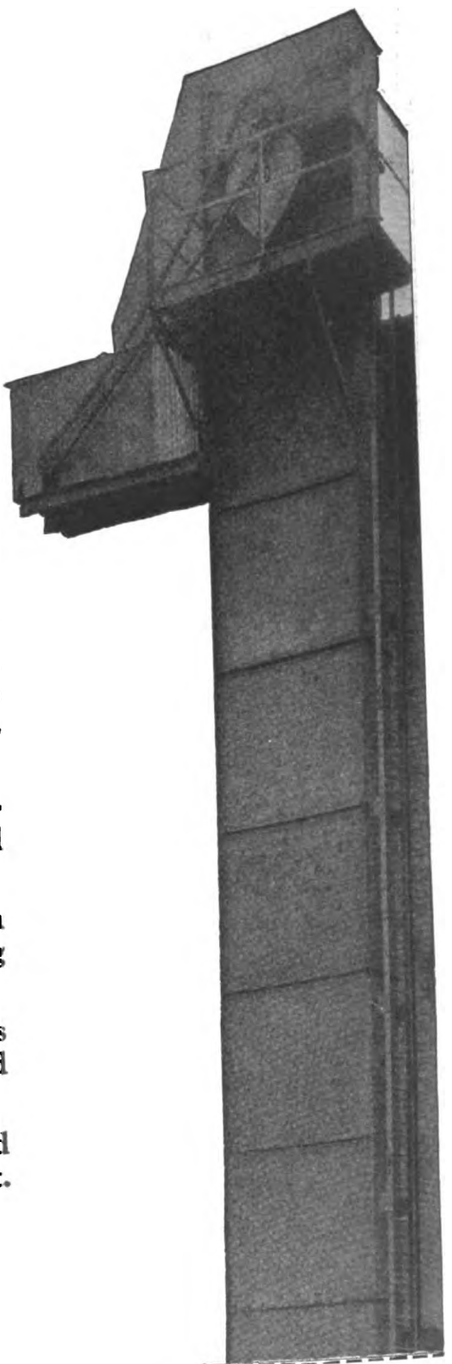
Accordingly, a Rex Economy Elevator, 33 feet 6 inches on centers, was ordered on September 11, 1924.

Sent to shop:
9/12/24

The engineering work necessary to build this elevator was completed, the work put into the shop, and sent to the production department on the following day.

Rex Economy Elevator shipped:
9/19/24

The elevator complete was shipped on September 19, 1924, eight days after the receipt of order, or six working days after work was received in the shop.



While it is not always possible to offer such an unusual delivery date on Rex Economy Elevators, the time for delivery will always be only a fraction of that heretofore required.

Rex Economy Elevators are not standard machinery. Each one is designed for a particular job, but the engineering necessary to produce them has been standardized.

It is only necessary to fit the engineering to the special needs of the customer, add the special section to give the required lift and assemble the elevator.

The current issue of "The Conveyor" deals with this forward stride in the material handling field. It is free. Send for it.

REX
ECONOMY
CONVEYORS

CHAIN BELT COMPANY
711 Park Street Milwaukee, Wis.

Chain Belt Company
711 Park Street
Milwaukee, Wis.
Please send me
"The Conveyor"
Name.....
Address.....
City.....

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Easy to Install to Maintain



ANY millwright can install Hyatt roller bearings on your line shafts. These bearings are split and can be put on without removing pulleys, clutches or other shaft equipment.

Just open the box, apply around shaft, screw the halves together. Only ten minutes' work and the power is on again.

No unnecessary labor, no long production delays, no heavy installation expense.

Once Hyatt bearings are installed they require no further attention except for oiling once every three or four months.

Without adjustments or repairs they operate year in and year out, saving their cost many times over through economies effected in power, lubrication and maintenance.

When installing new or replacing old line shaft equipment you can be assured of full satisfaction by insisting on Hyatt bearings.

'Phone the Nearest Mill Supply Dealer

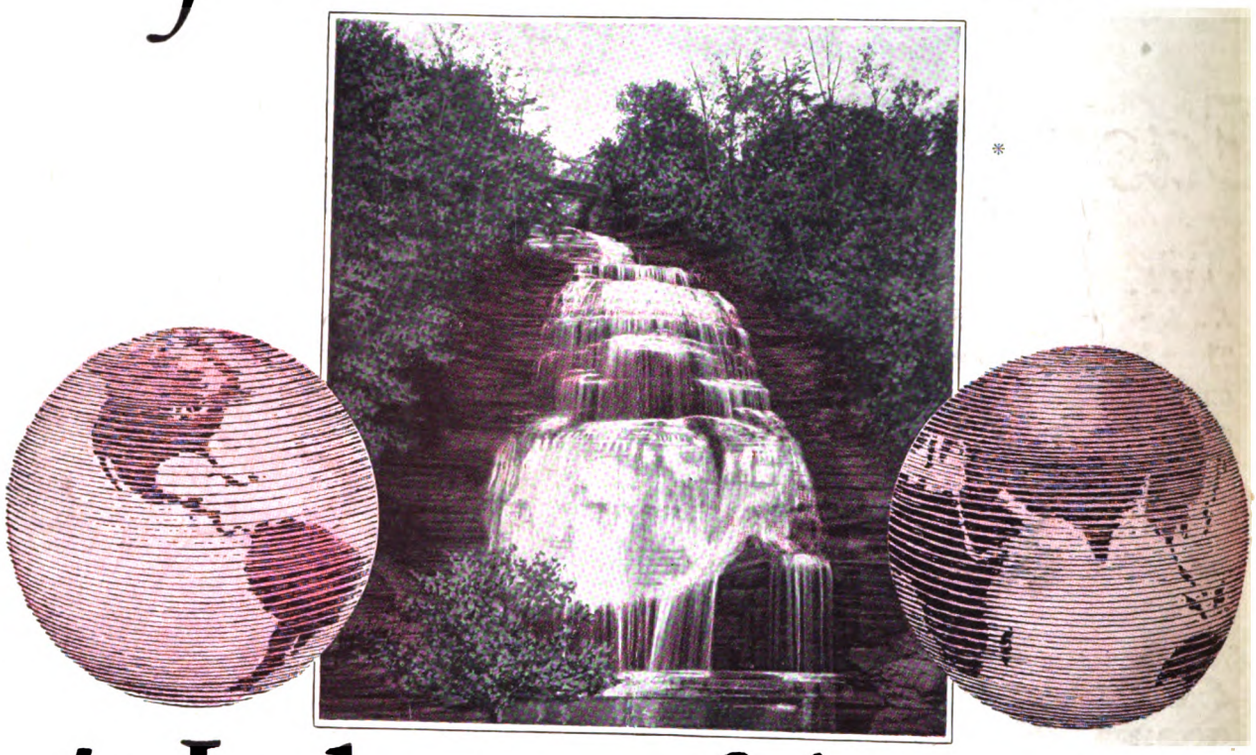
[*Write for Bulletin 130.* It contains information of interest on power transmission and a list of Hyatt bearing users.]

HYATT ROLLER BEARING COMPANY
NEWARK, NEW JERSEY
PACIFIC COAST ADDRESS: SAN FRANCISCO, CAL.

HYATT ROLLER BEARINGS FOR LINE SHAFTING

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from Montour Falls



to Industry of America and the World

For many years Montour Falls has been a community of engineers and machinists, builders of electric cranes and hoists.

It is here that the Shepard Electric Crane and Hoist Co. was founded over a quarter of a century ago. It is here that Shepard Cranes and Hoists are still built.

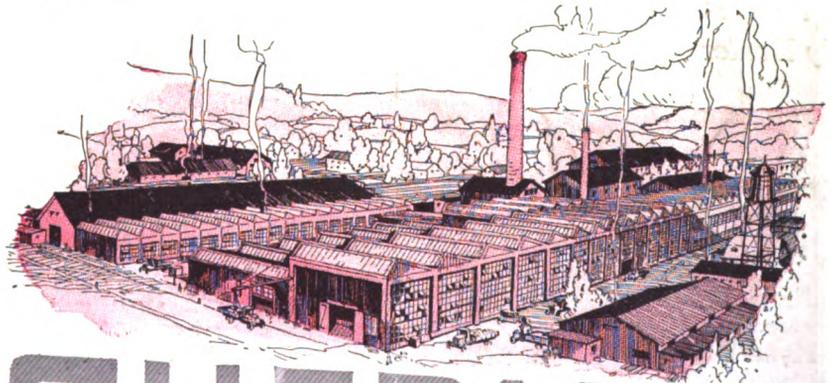
During this quarter century the Shepard Company has grown to be the largest manufacturer of Electric Hoists in America.

The assured service of Shepard Equipment is a profitable aid to production in the plants of thousands of manufacturers and in the establishments of distributors of commodities of every kind.

On lower left hand side of this page are listed the principal pieces of equipment Shepard makes. Each has its place in industry and provides the economy sought by business executives.

Equipment for every lifting and load-moving service

- Shepard Electric LiftAbout Floor Operated Electric Hoists
- Electric Traveling Cranes
- Grab Bucket Cranes
- Transfer Cranes
- Single I-Beam Cranes
- Jib and Bracket Cranes
- "Aerial Railway of Industry"
- Cage Operated Monorail Hoists
- Grab Bucket Cage Operated Monorail Hoists
- Cupola Charging Hoists
- Back Geared Motors
- Winches
- Speed Reducers



SHEPARD

ELECTRIC CRANES & HOISTS

***A view from our office window**

You are cordially invited to visit us at Montour Falls in the Finger Lakes Region of New York State.

You will enjoy the scenic beauty of our waterfalls, glens, hills and lakes. And a trip through our plant will prove most interesting.

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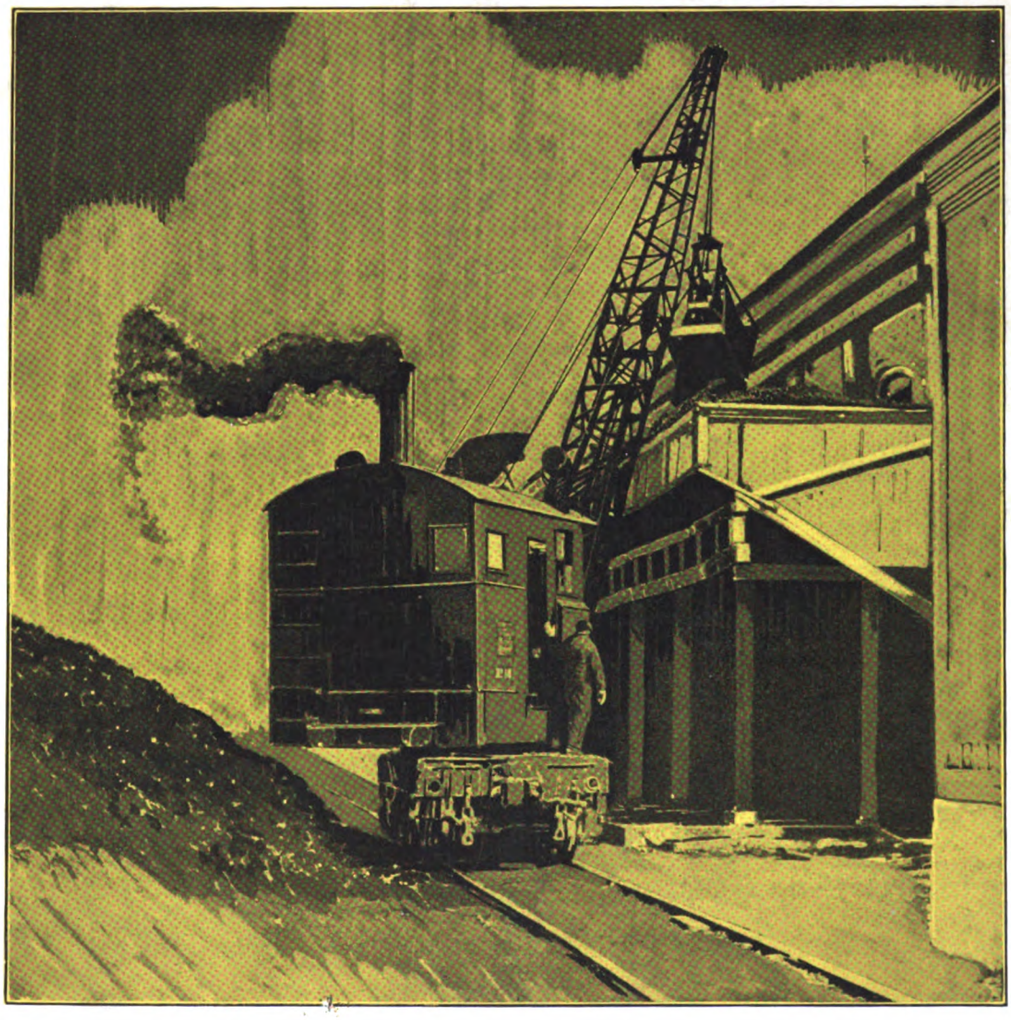
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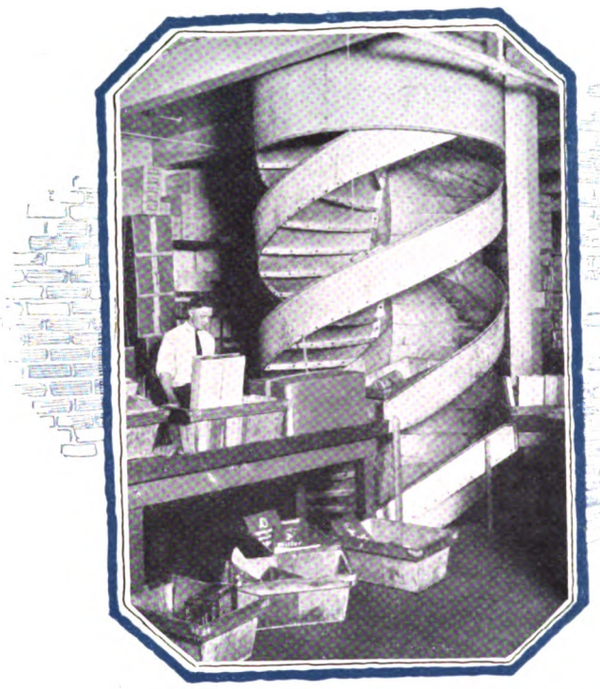
Practical Management Pictorialized

Reg. U.S. Pat. Off.

APRIL-1925



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Jim Is In No Hurry

He runs a freight elevator and it doesn't travel very fast anyway. Besides that, on every floor where Jim stops some of the boys need a little lift or have something to discuss. The load has to be shifted around to make room for one more box. Something has to be taken off before something else can be put on. All that takes time. Jim's time. And it wears him out. It also takes his associates' time, and his company's time.

If Jim's company used a Spiral Chute to lower all the merchandise that could be lowered—Jim wouldn't have to run the elevator backwards. He would still have plenty to do bringing merchandise up from the first floor. Electricity would be saved. Labor would be used properly. Time would be put to better use.

Let us send you a Spiral Chute Catalog showing how Jims are made more valuable to their Company.

Yours for the asking Catalog S-4

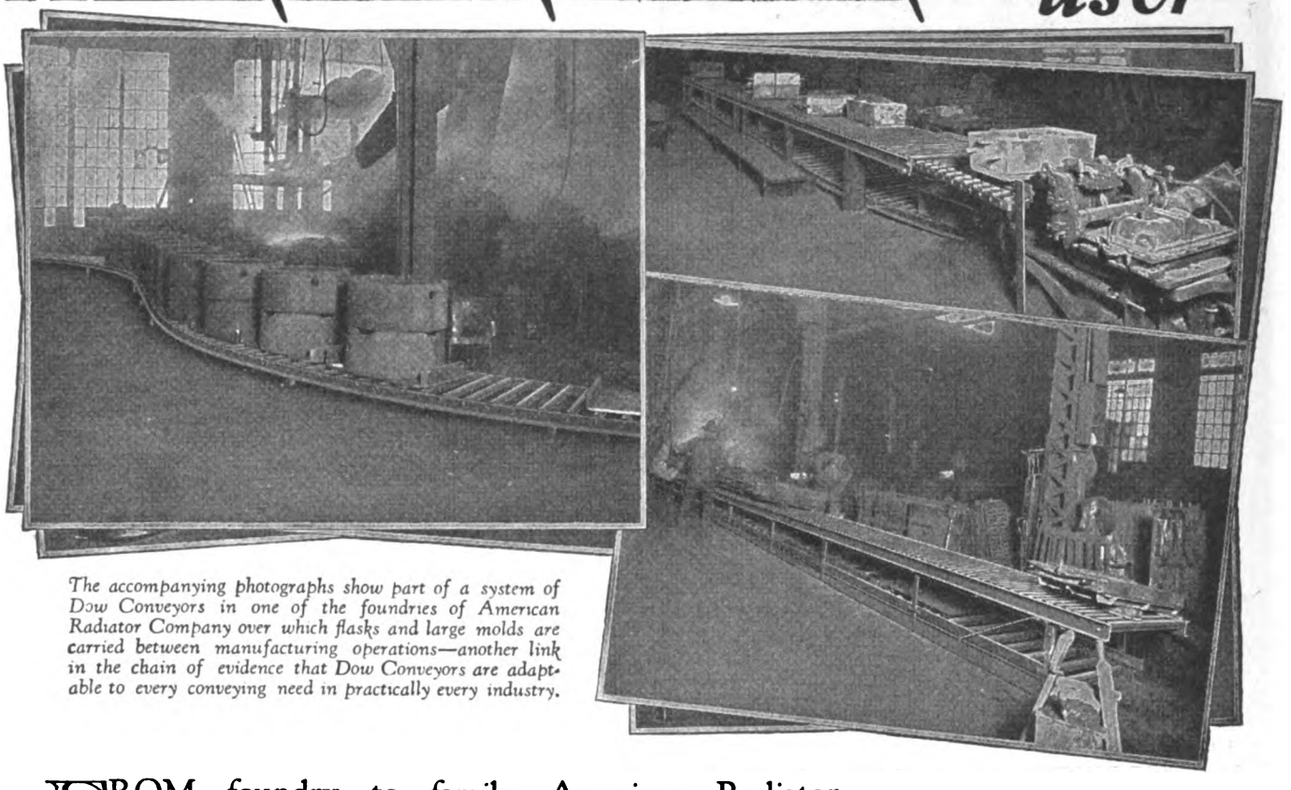
STANDARD CONVEYOR COMPANY

NORTH SAINT PAUL, MINNESOTA

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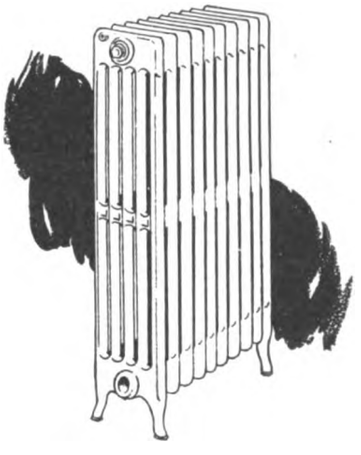
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AMERICAN RADIATOR—another user



The accompanying photographs show part of a system of Dow Conveyors in one of the foundries of American Radiator Company over which flasks and large molds are carried between manufacturing operations—another link in the chain of evidence that Dow Conveyors are adaptable to every conveying need in practically every industry.

FROM foundry to family American Radiator products are kept moving to supply the needs of a growing nation. Naturally such approved equipment is in wide demand and naturally every efficient and economical means of supplying that demand must be utilized by the manufacturers. Dow Conveyors are contributing their share toward this end even though their name does not appear on the payroll. What next? Your products may be very different. And yet, in all probability, Dow Conveyors can effect substantial savings in time, labor and money in your conveying processes. Our nearest office will gladly consult with you.



The heating system in any building may be aptly compared to the heart and arteries of the human body—efficiency in operation is essential to both. The American Radiator Company has applied this principle of efficiency not only to the performance of its products but also to the handling of parts and finished equipment in its plants.

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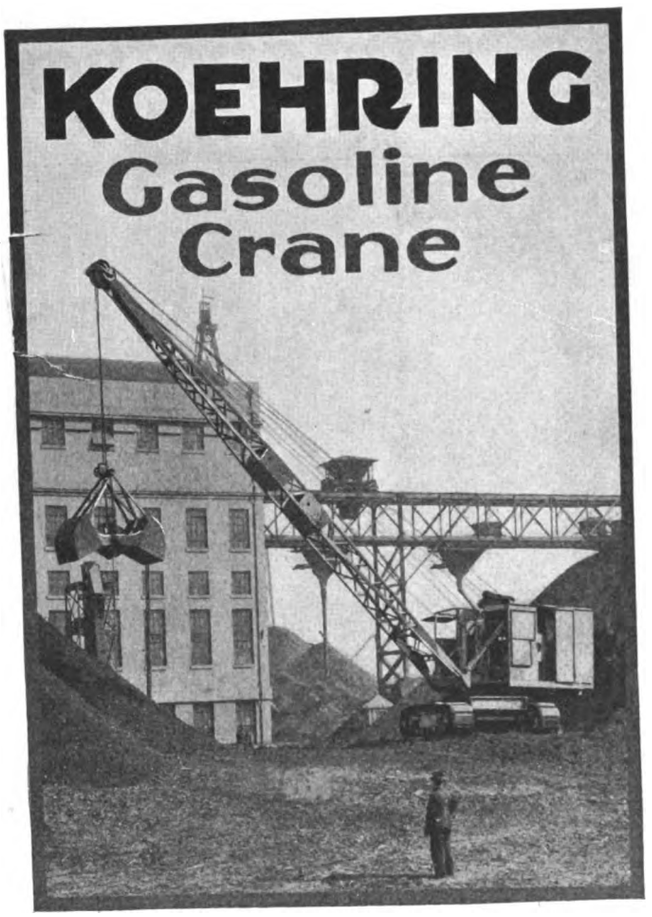
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Will any of these little plants of today be the big plants of tomorrow?

* * * *

Suppose you had asked this same question twenty-two years ago, of Old Father Time, who knows the past, present, and future.

He would have pointed out to you a small and inconspicuous machine shop employing a handful of men and paying its chief engineer two hundred dollars a month.

"In twenty-two years," he would have said to you, "this little plant will have a cash surplus of three hundred million dollars, and that chief engineer, now in overalls, will be the richest man in the world!"

* * * *

Merely another "Ford story," of course, but it's a true one.

And it shows that little establishments can become very, very big if they have good ideas plus good management.

It is these *good ideas*—the practical, workable ideas which other plants, little and big, have evolved—that INDUSTRY ILLUSTRATED aims to put before you each month. And in such fashion as to require a minimum of your time.

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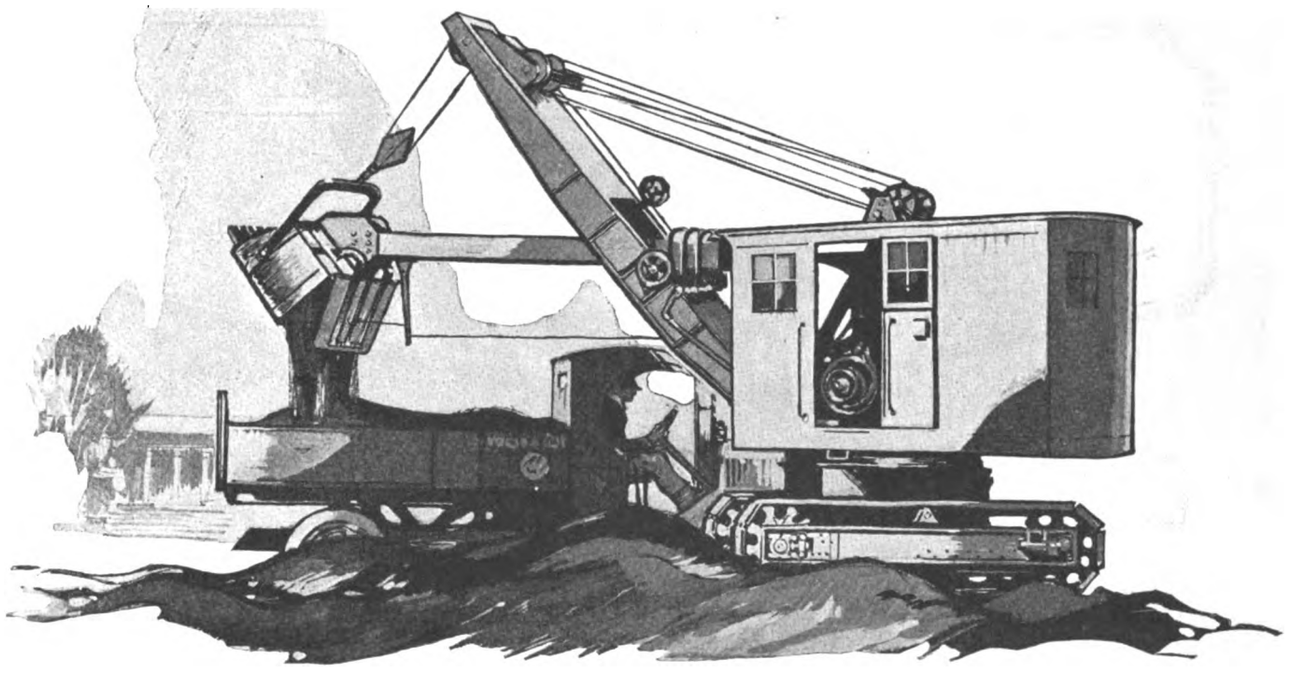
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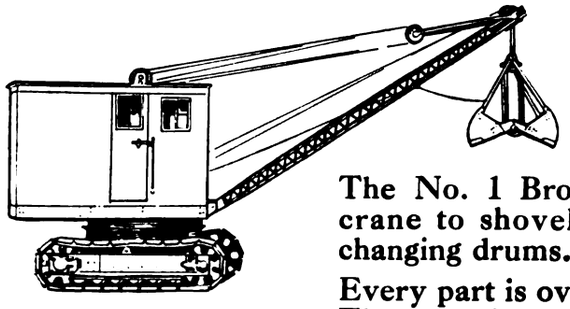
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This is the No. 1 Brownhoist in use as a crane, with one-half yard clamshell bucket. Quick and easy convertibility gives two machines for a little over the cost of one. There are only 18 gears and all parts are easily accessible.

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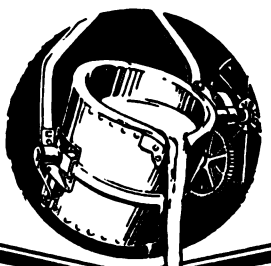
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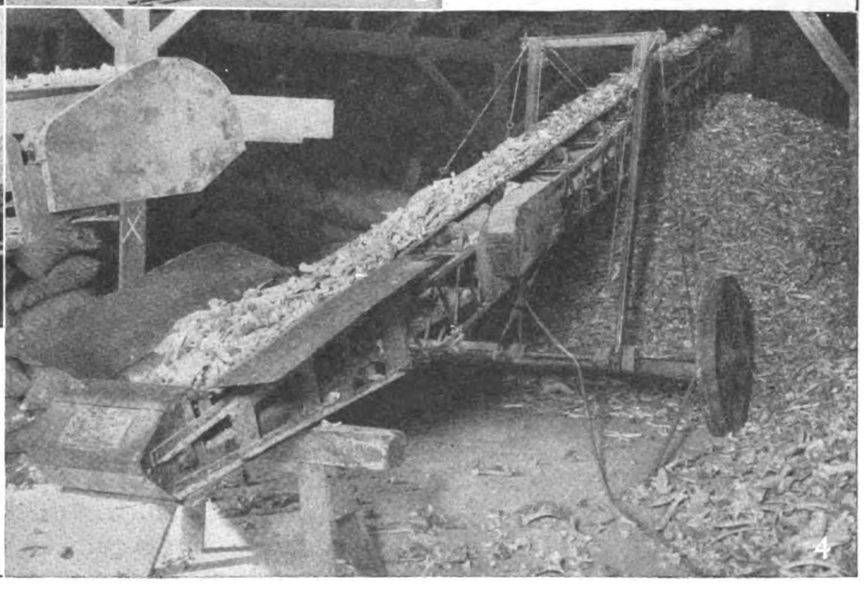
1—A Barber-Greene Conveyor loading a car for a South Carolina Public Service Company.

2—A Barber-Greene Conveyor, unloading bone from a hopper-bottomed car. This conveyor delivers to the conveyor shown in Cut No. 4—eliminating a great deal of the hand labor formerly used.



3—A Barber-Greene Bucket Loader equipped with electric drive loading tan bark. This machine is an efficient time and money saver on material loading.

4—A Barber-Greene Conveyor piling bone for the Pacific Bone and Fertilizer Company. Notice how another Barber-Greene delivers to it.



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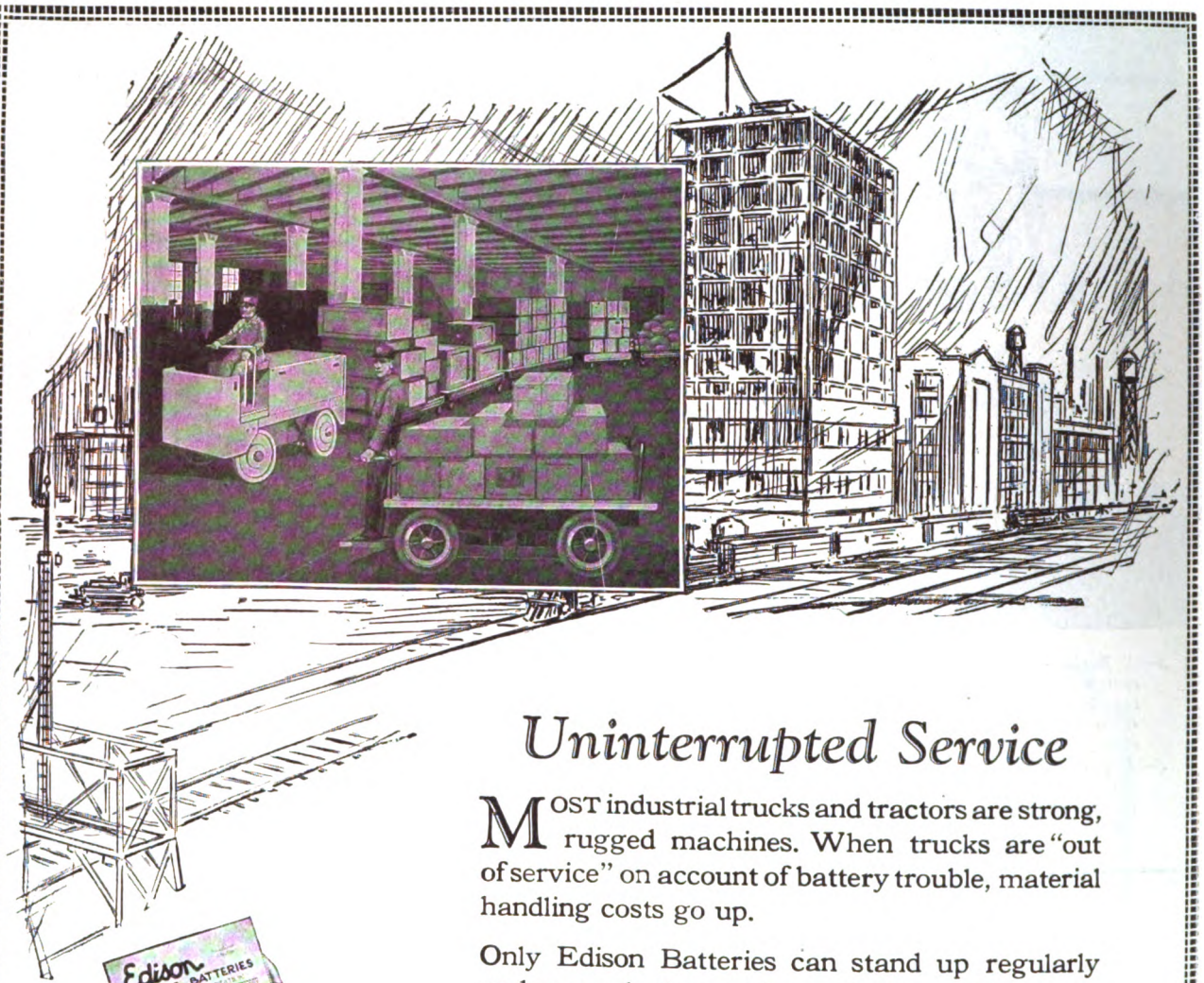
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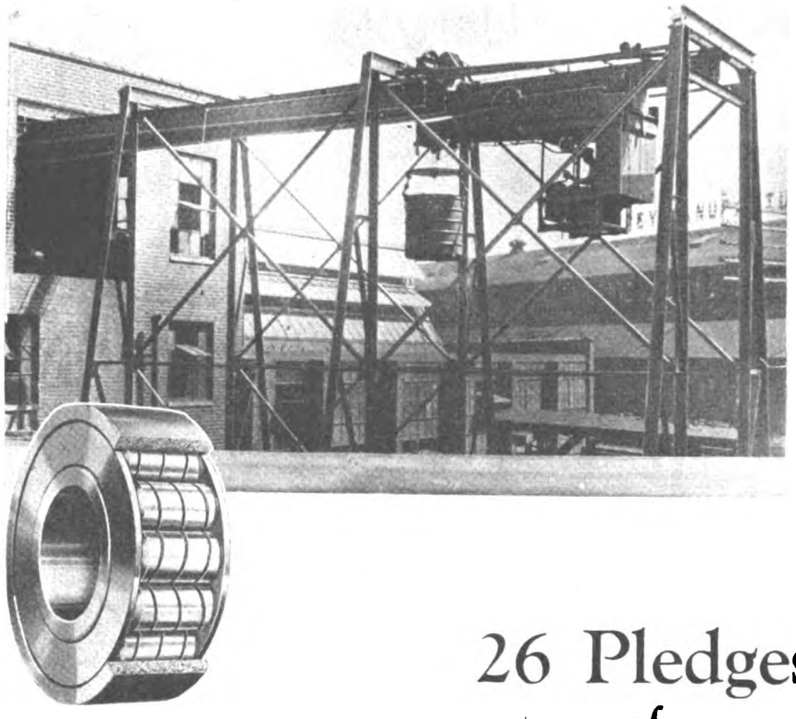
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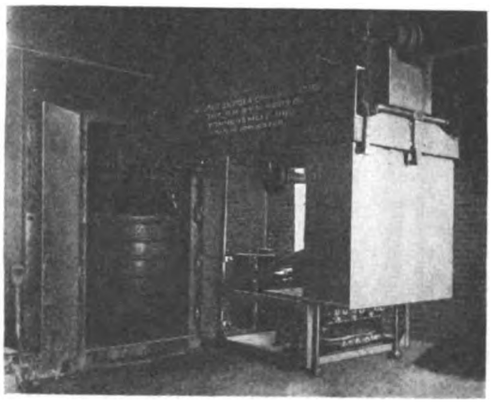
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26 Pledges *of* Economy, Speed and Dependability

HANDLING from 40 to 125 tons of material every twenty-four hours, Roots charging hoists are always equal to the task because twenty-six Hyatt roller bearings insure continuous, carefree operation.

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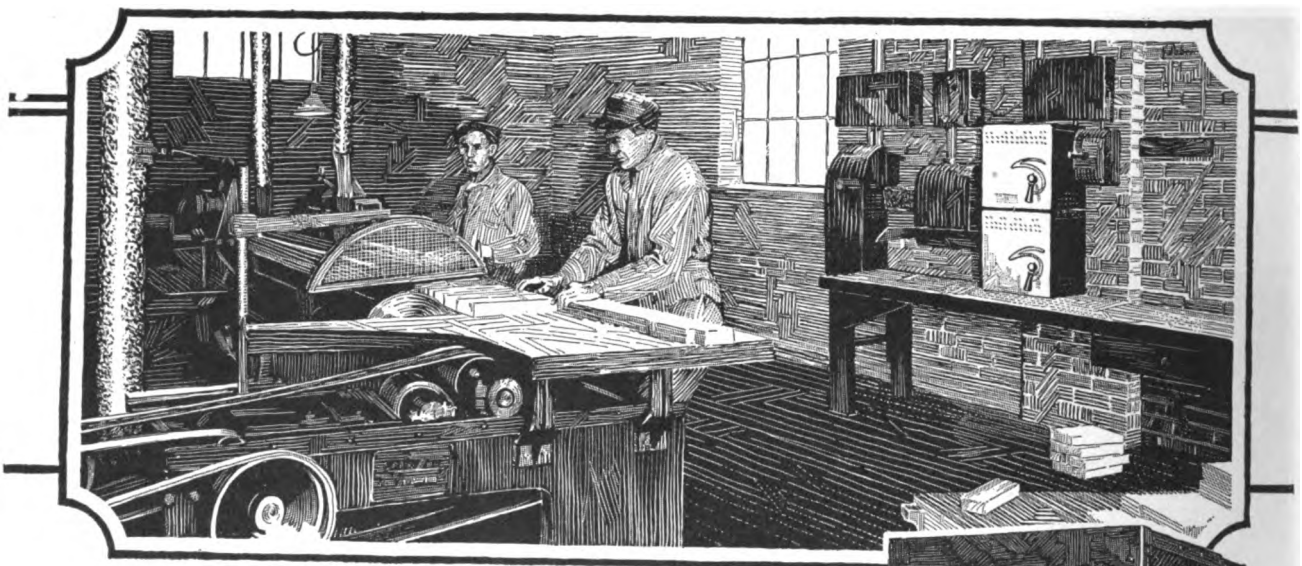
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U-Re-Lite has been chosen by the leading industrial executives, efficiency experts, safety engineers and other engineers as the ideal means of protection for electrical equipment worth many times the cost of the U-Re-Lite.

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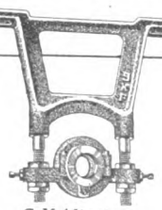
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About two years ago, a Milwaukee manufacturer found that power, oil and labor were being stolen—vanishing without trace or clue. Friction was the thief—using as his tools babbitt bearings which required frequent oiling and alignment.

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APRIL, 1925

Industry Illustrated

The Pictorial Presentation of Practical Management

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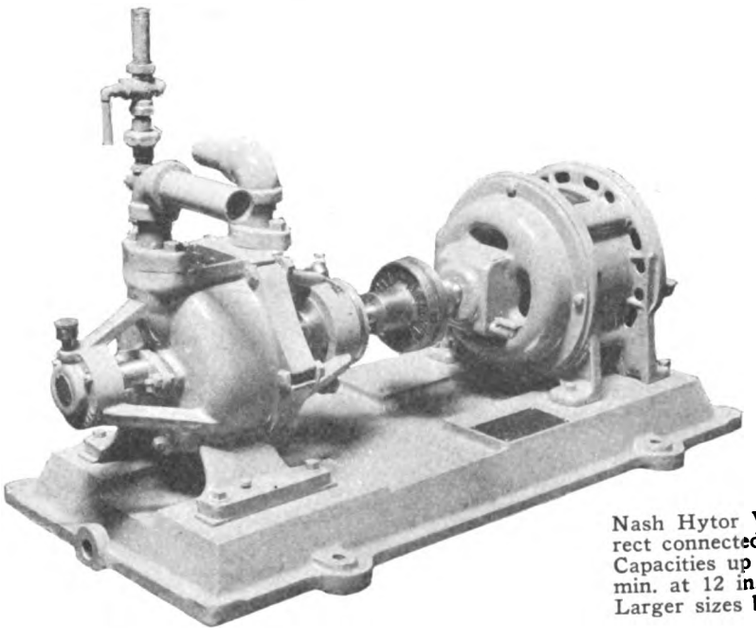
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for handling air and gases



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Industry Illustrated

The Pictorial Presentation of Practical Management

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ADOLF SCHILDKRAUT, *Art Director*

Editorial

Checking Up the Little Things

THE old fable of the huge elephant whose life was saved by a tiny ant, has a profitable moral for men in industry.

This moral may be expressed in a few words. Never neglect the little things. Little things may make or break your business.

In running a business, or managing a factory, the danger does not lie in committing a few big mistakes so much as in making a large number of little errors. Big affairs stand out so prominently that they have to be "right" or nearly so, to "get by." Little affairs often take advantage of their smallness to sneak in the back door, unobserved. When these little things are wrong, they can usually eat up a lot of profits before being caught and evicted.

Small tools in some plants are regarded as little things, and get in without much scrutiny. When wrong, a two-dollar twist drill or reamer, or an inferior twenty-dollar driving belt, or a poorly chosen grinding wheel costing twelve dollars, may take away half or more of the earning power of the ten thousand dollar machine which depends on and utilizes their services.

A dollar tap that is too soft or too hard may hold up promised delivery on a ten thousand dollar order and lose you your customer's good will.

A five-dollar micrometer that is inaccurate may spoil the operation of the fifty thousand dollar machine you are building.

Files with soft teeth will nevertheless bite savagely at profits; belts with poor pulling power will tug strongly at dividends; hacksaws that balk at steel will nevertheless steal time.

Check up on the little things. Make sure that you know what you are buying or that you can depend on the people you are buying them from. The latter is safer and better.

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The Great City

New York—Center of a Sixty Mile

By John

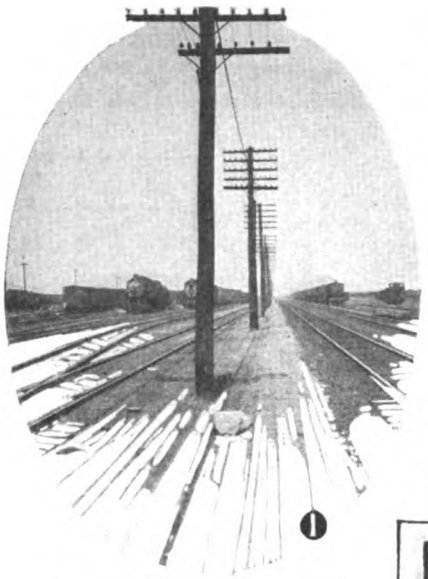


Fig. 1. The great accumulation of people and property in New York reacts on every industrial step. In the Jersey meadows great trains end their journey and unload. The freight is broken up for distribution by truck, short line, or lighter to its destination.

NEW YORK! That magic name has brought more triumph, and caused more tears, than any other one place in this country's history.

Wooded island of the rippling Hudson, on your shores the Dutch sailor thrilled with new hope for the kinsmen of his oppressed land. Bustling port of a young civilization, from your docks wonder ships exchanged the riches of two worlds. Through your gates came the immigrant craftsmen of Europe to build with the capital of the pioneers ten thousand smoking chimneys of industry. By river, road, and rail, a continent cleared through your streets. Wealth, population, fame, brains, and beauty—today you have all, and the youth of a nation yearns for the romance beneath your lights, for the rewards you give to ambition!

Alas for the vanity of man and his gilded works! Did Hudson, roaming in the fields of Manhattan, dream of a day when thousands would fight for a foot of greensward? Did the shipping kings foresee a time when packed steerages would leave peasant farms never again in their lifetimes to know fresh air and sunlight? Could

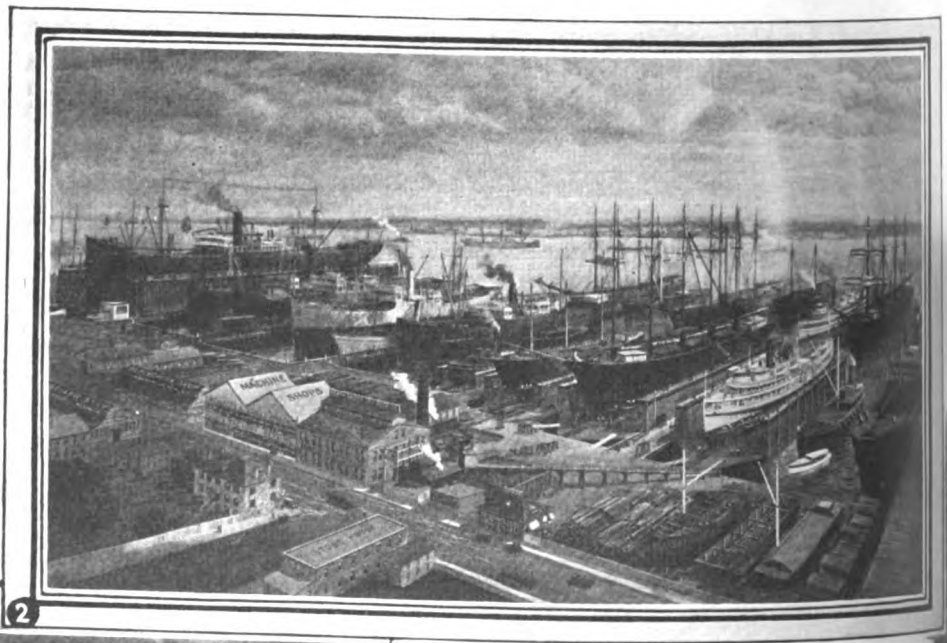


Fig. 2. Perth Amboy, N. J., is rapidly becoming an important shipping center, with splendid harbor facilities; and many textile, metal, chemical, and clay products plants are taking advantage of the fact.



Fig. 3. The DuPont Fabrikoid Company's branch plant at Newburgh on the Hudson has prospered in this happy home town. This shows the splendid plant's recreational facilities.

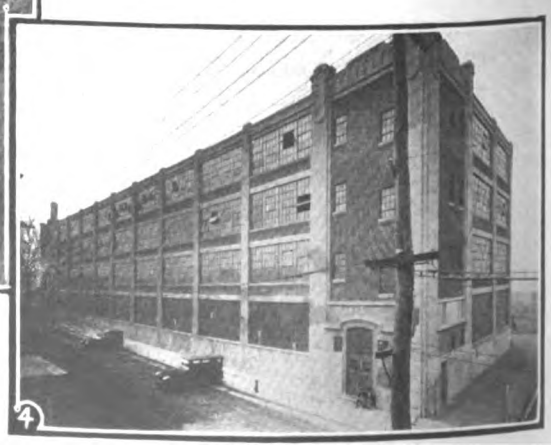


Fig. 4. This plant was built by the merchants of Paterson, and attracted the purchaser, Wright Aeronautical Corporation, makers of motors. Civic enterprise pays dividends.

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Reaches Out

Kingdom of Work and Play

A. Piquet

the master-minds of industry and finance, caught in their walls of steel and gold, know what their gigantic enterprises were meaning to the city's millions?

Ambitious man struggles mightily for supremacy, but the divine laws of the vast, silent universe decide. Once more, another Tower of Babel seemed to have been erected. Once more a confusion of strivings for power and place were to find their sure reward. Like the great cities of the past, in the full hey-day of triumph and pride, blazing with a million lights like some great Leviathan of the land, New York stood the undisputed master of material and ethical progress, and yet also a crusher of human lives par excellence.

Here was the concentration of the best and the worst. Here was the end of the race for success and happiness. New York was the exemplification of individualism of the competitive struggle, of the triumph of the strong over the weak, and the imprisonment of the masters in the chains of their slaves.

The industrial lesson of New York's past is a lesson of an uncontrolled race for wealth, of wholesale concentration of industry at a vast supply of cheap immigrant labor, of an unplanning material individualism, of a record crowding of people and bad housing, of high overhead, labor troubles, and freight and transit muddle—and finally of the reaction of the whole human industrial ensemble, both capital and labor, against the chains of a concentrating, congesting materialism that bound

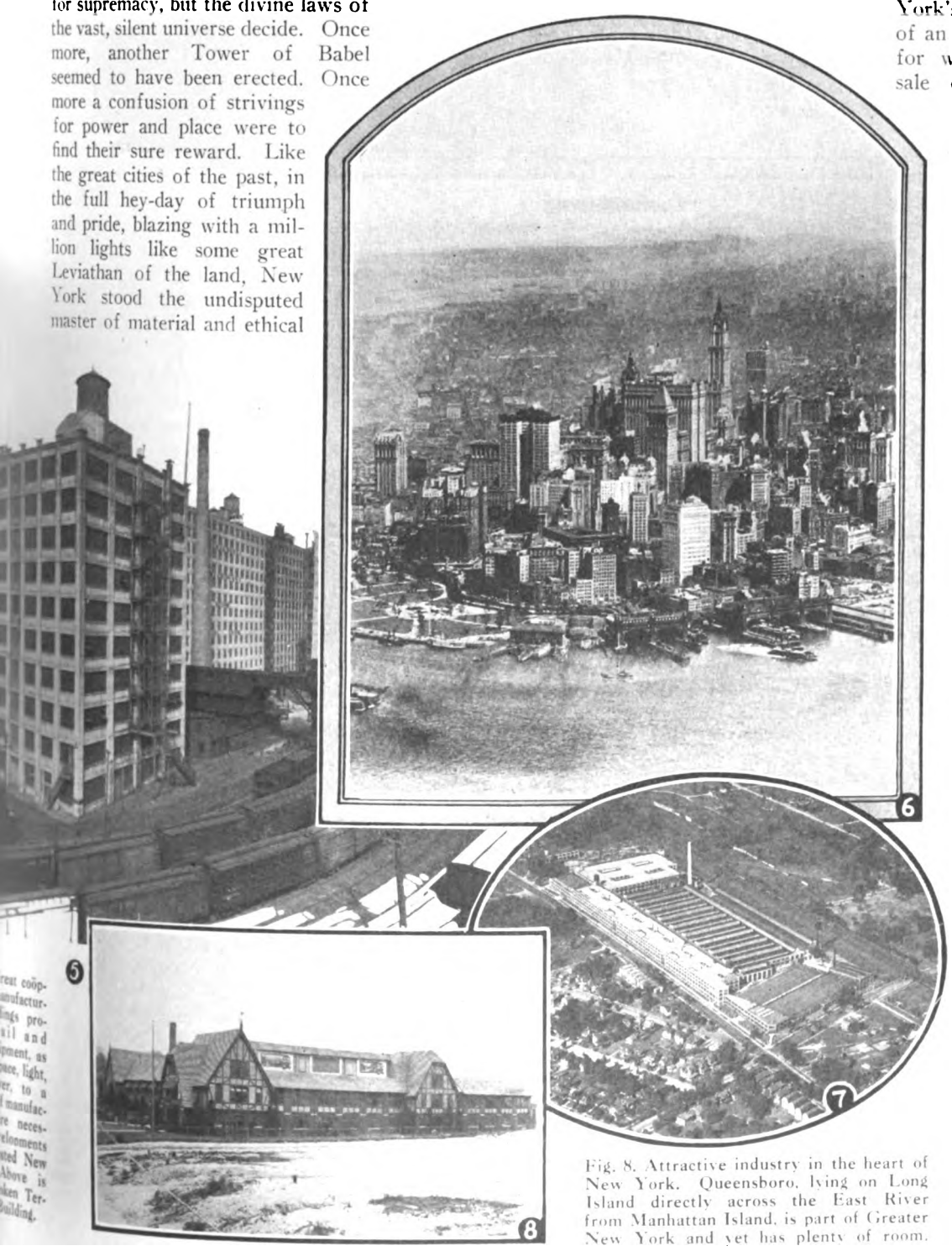


Fig. 6. The Queen City of Commerce and Finance. New York's offices and warehouses claim priority over industry in the central area, but become great advantages to manufacturers who are on the outskirts.

Fig. 7. The greatest single automobile plant in the world. The Durant factory between Newark and Elizabeth has plenty of room and yet is near the nation's main motor market.

Fig. 8. Attractive industry in the heart of New York. Queensboro, lying on Long Island directly across the East River from Manhattan Island, is part of Greater New York and yet has plenty of room.

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them both, militating against industrial efficiency and human hope.

Back to the land has been the battle-cry of every rebirth of progress, and back to the spacious area around the great city industry and homeseekers go. A city no longer, New York today is a sixty mile circle of an infinite diversity of industry, homes, and pleasure spots, while at the core, the city proper, center the nation's commerce, finance, and culture.

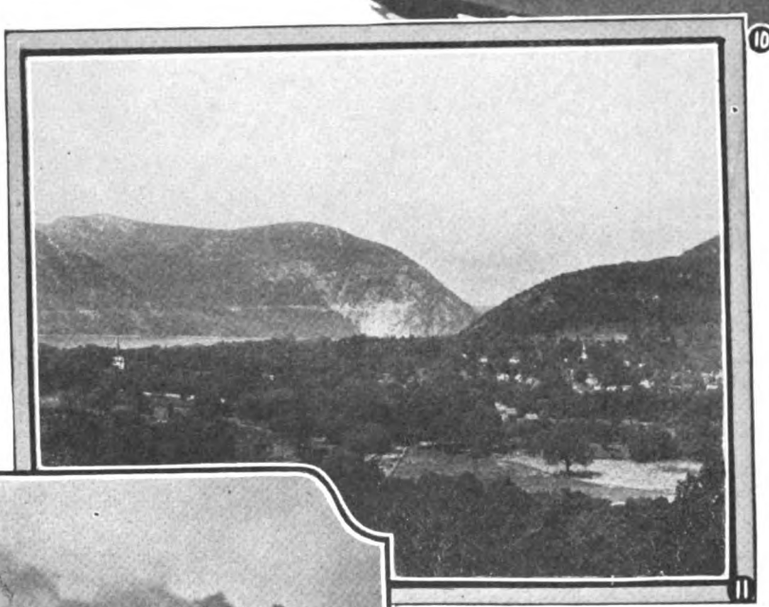
To the north, up the beautiful Hudson valley far above Poughkeepsie; to the west, over North Jersey's rivers, ports, and ascending valleys; to the South, strategic Staten Island, and agricultural-industrial Central and South Jersey; and to the East, accessible Queensboro, outer Brooklyn, and rural Connecticut, the Greater Metropolitan Area of New York supplies all varieties of site, transportation, and people to accommodate the enormous disgorging movement of a multiplicity of industries and races so long jammed together, and now seeking air, sunlight, and all the facilities of civilization for the fundamental activities of production and work, home-owning, recreation, and the pursuit of educational and religious culture.



Fig. 9. Manufacturing in New York's congestion is increasingly shifting to developments like this, the enormous Bush Terminal in Brooklyn on New York bay.



Fig. 10. The large Metropolitan area is studded with fine schools, churches, and other living facilities, one of the great reasons industry and population have not hesitated to come from fastidious New York.



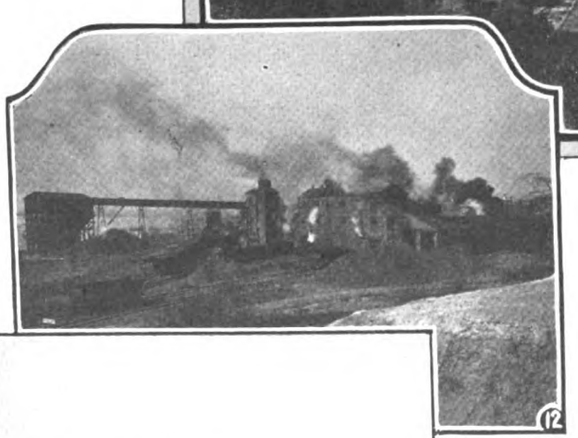


Fig. 11. All along the beautiful Hudson River valley little towns like this offer opportunity to industry. They have transportation, labor, and reasonable living costs, as well as accessibility to New York.

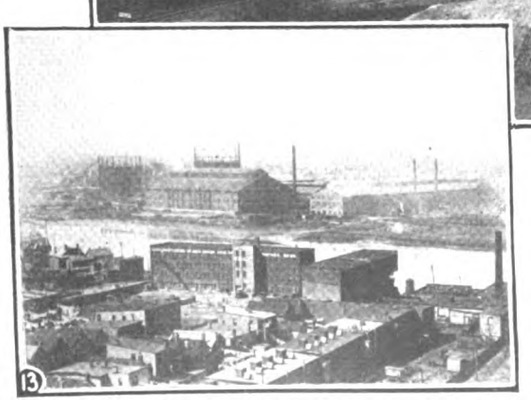


Fig. 12. A future Pittsburgh. The Navicoal Briquet Corporation locates at Perth Amboy, N. J., where coal arrives by rail and water from many points. Ores from Southern points by ship are available, and an iron and steel industry is forecast.

Fig. 13. Reclamation work near New York. This air view shows the Hudson to the extreme right, Jersey City in center, and the "Meadows," to the left.

In this area, 9,000,000 people live. In 50,000 factories, over a million workers turn out eight billions of dollars' worth of products. New York City still crowds 32,000 of these factories within its narrow limits, and 750,000 workers, add to the subway and housing problems. Over 300,000 persons, engaged in the city's office and executive life, commute daily by railroad, tunnel, and ferry from the towns and suburbs that dot the surrounding area. The buyers and sellers of several continents clog the Pullmans and the hundred large hotels, while from a thousand righteous Main Streets, young and old travel to see the Great White Way and the glitter of the magnet of pleasure, fashion, and art.

The bulk of the manufacturing is still done in the city, by very force of inertia. Yet the appeal of the area makes great inroads into the largest lines of activity. New York's mon-

(*Continued on page 92*)

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"If Winter Comes"

An Interesting Prediction, and Some Useful Suggestions

By Russell Byron Williams

THE summer last year was universally cold, backward, erratic. Next summer (1925) will probably be much colder. 1926 may have no summer at all. At least weather experts and scientists of the Smithsonian Institution are inclined to that belief.

Having no summer—no growing period—but merely a continuation of twelve months of freezingly cold weather is a very sombre outlook. In such an instance, the realization would probably exceed anticipation.

To many, thought of a summerless year is absurd, impossible. Never having had such an experience, it is difficult to imagine the extent of such a catastrophe. But there have been summerless years, and what has been can be again.

It is a matter of history that the year 1816 was one of extreme severity. During that year practically no crops were raised north of what was later known as the Mason-Dixon line, and only a partial crop in the Southern states. A half inch of ice formed in New York City on July 4, 1816. That year was known as the "year without a summer" over a large part of the world, for Europe, it seems, was similarly affected.

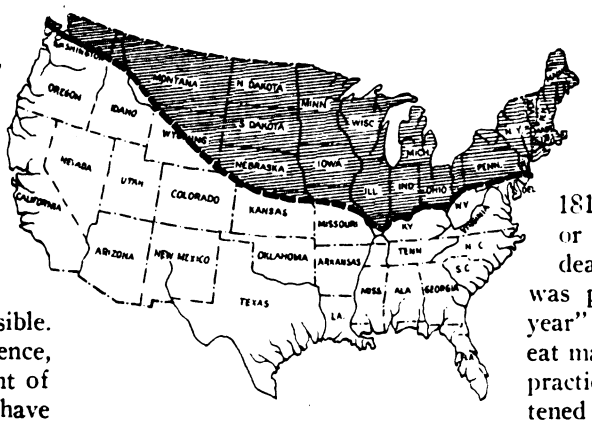


Fig. 1. The shaded portion shows approximately how far scientists say the ice covered what now is our country, in that far distant glacial epoch.

Blodgett in his "Climatology of the United States" tells us that all the summers from 1811 to 1817 were cold in this country and that in every summer month of both 1812 and 1816, snows and frosts occurred throughout the United States. 1817 was known as "poverty year" or "eighteen hundred and froze to death." In New Hampshire it was popularly known as "mackerel year" because people were forced to eat mackerel instead of beef or pork, practically none of which was fattened owing to the scarcity of corn.

Further assurance that 1816 was "a year without a summer" appears in Charles Pierce's "Weather in Philadelphia." Speaking of that locality, Pierce says: ". . . there was ice during every month of the year, not excepting June, July and August. There was scarcely a vegetable came to perfection north and east of the Potomac." Also, in the "Monthly Weather Review," which gives the writings of James Winchester of Vermont, there appears: "It is said that in June of that year (1816) snow fell to a depth of three inches in New York, Pennsyl-

(*Continued on page 66*)



Fig. 2. If the semi-scientific prediction discussed by the author come true this might appropriately be called "A view of Fifth Avenue, New York, in July, 1926." (©U. & .U.)

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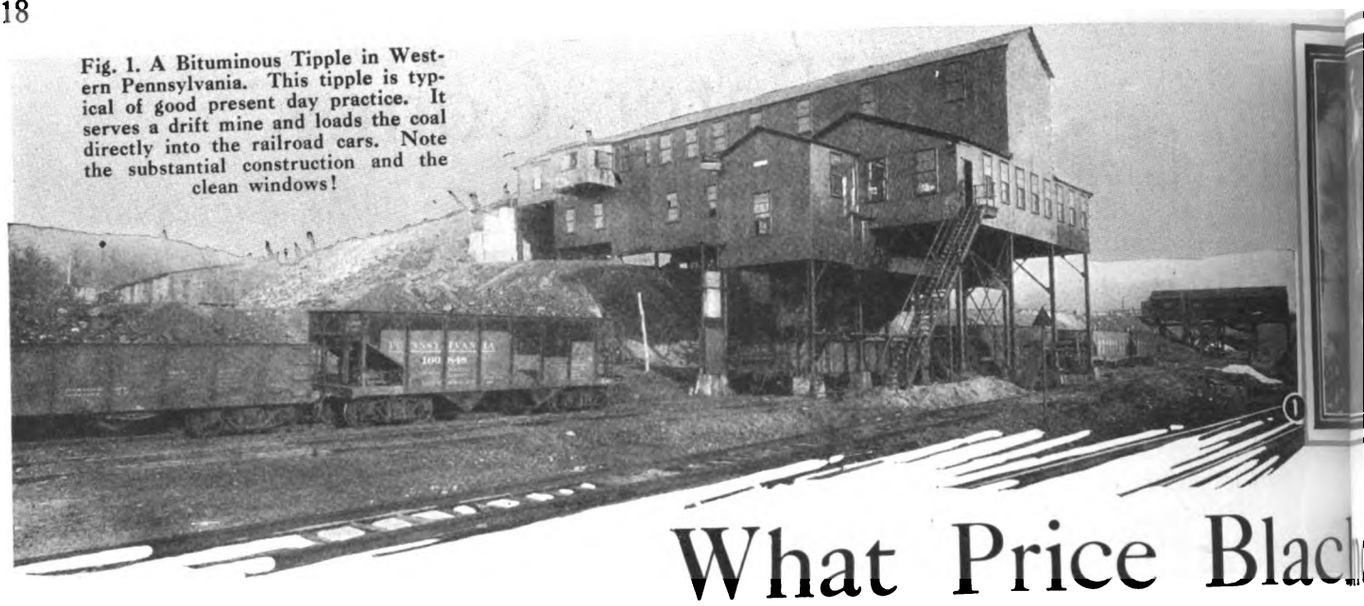


Fig. 1. A Bituminous Tipple in Western Pennsylvania. This tipple is typical of good present day practice. It serves a drift mine and loads the coal directly into the railroad cars. Note the substantial construction and the clean windows!

What Price Blac

Are You Getting the Most Econom

By Fra

THE coal you burn so nonchalantly in your power plant is one of Nature's greatest gifts to mankind. Have you ever stopped to consider how appallingly it is being wasted?

Possibly you have thought of the term "black diamonds" as an ironical reference to its increasing price per ton. It is a fact, however, that coal, when considered according to its usefulness to mankind, is a thousand times more valuable than any precious stone or rare metal.

Yet the average industrial power plant today is extracting and utilizing only about thirty cents worth of heat energy from each $5.00 ton of coal burned; while every single one of the precious by-products are wasted up the chimney.

Long ago the packer found that his profits came from the by-products of the pig, and not in the meat. And we know that in every $5.00 worth of coal there are $2,300 worth of coal tar by-products in addition to the heat energy. Some day we shall learn how to recover and utilize these by-products at the same time that we use the coal for power.

Merely to list the useful things which come from coal tar would take several pages of this magazine, covered with fine type. Nevertheless, a brief mention of the most important



Fig. 3. Breaking out soft coal with an air drill. Notice three differences here from the practice in anthracite mines: 1. The drill has a long taper, for quick sinking. 2. The coal is broken out immediately instead of beintg shot. 3. Compressed air is used instead of electricity for safety's sake.

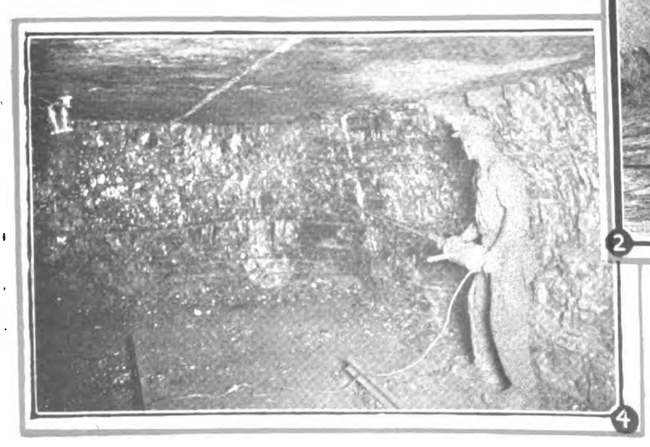


Fig. 4. Drilling shot holes in a hard coal heading. The miner drills a series of deep holes the full length of the bit, at the top, bottom and sides of the face. Blasting powder is then carefully tamped in each hole, and all the holes are shot at one time, breaking out a section of coal the full depth of drilling.

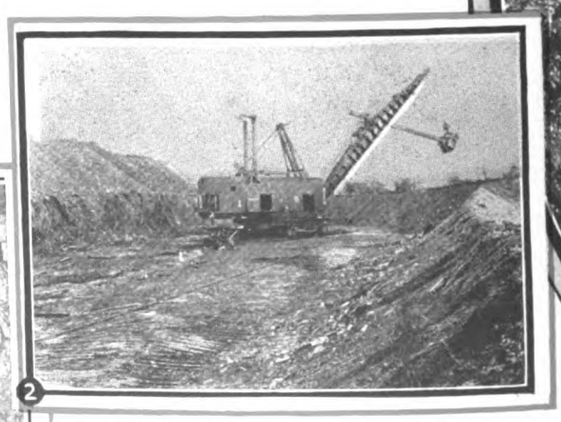


Fig. 2. This does not look like coal mining—but it is! Sometimes the coal lies so close to the surface, with no solid rock above it, that a big steam shovel can strip off the entire overburden. (Photo Courtesy of Coal Age)

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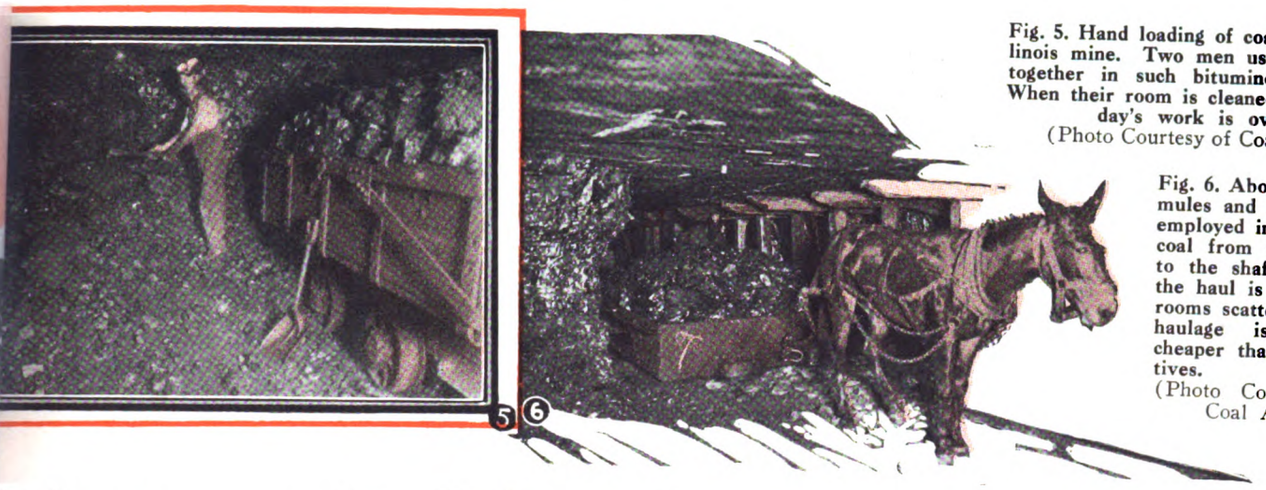


Fig. 5. Hand loading of coal in an Illinois mine. Two men usually work together in such bituminous mines. When their room is cleaned up, their day's work is over.
(Photo Courtesy of Coal Age)

Fig. 6. About 57,000 mules and horses are employed in gathering coal from the rooms to the shaft. Where the haul is short and rooms scattered, mule haulage is usually cheaper than locomotives.
(Photo Courtesy of Coal Age)

e Diamonds Now?

M Coal for Your Power Plant?

traschek



will serve to point the argument.

Tar is contained in coal in varying percentages by weight, from less than 2% in anthracite to 42% in the western varieties of bituminous.

When coal tar is distilled in a closed vessel at gradually increasing temperatures, four different oils are produced in succession. From these four oils a vast body of our present day chemistry is born. Here is a bird's eye view of it:

Crude Naphtha

Naphtha, used in waterproofing materials;

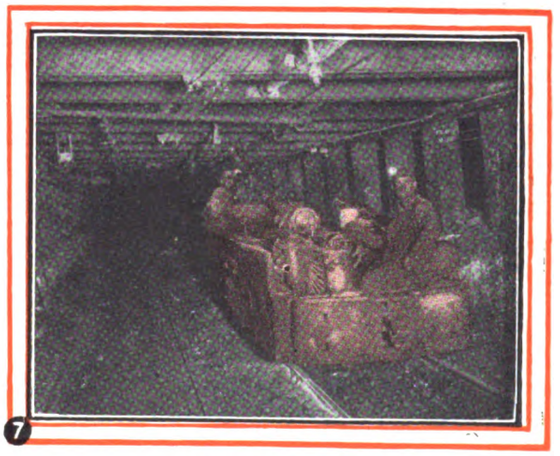


Fig. 7. Locomotive haulage in a southern Illinois mine. Coal mines haul more coal than the railroads. 20,000 electric locomotives are used in American mines. The 50,000 electrified miles of mine trackage total more than all the street railways, interurban lines and electrified steam railroads of the United States put together!
(Photo Courtesy of Coal Age)

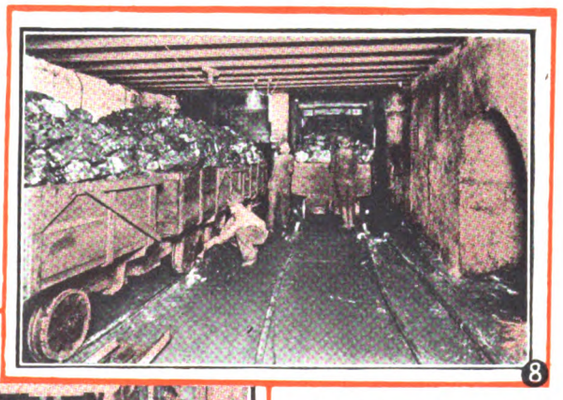


Fig. 8. Loaded mine cars waiting to be hoisted up the shaft.
(Photo Courtesy of Coal Age)

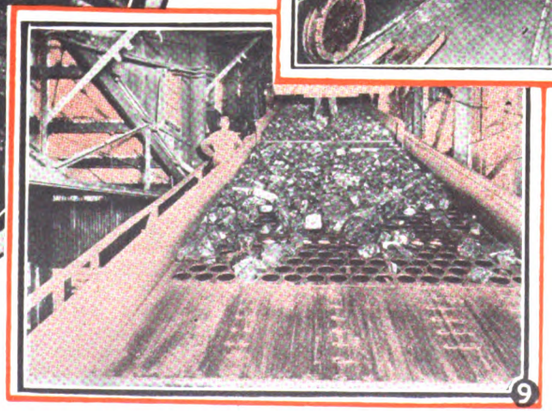


Fig. 9. The shaking screens in a bituminous tripple. The smaller sizes pass through the screens at the upper end, leaving the larger lumps to discharge directly into the railroad cars

Naphthalene, used in making celluloid and as a base for many dyes;
Benzol, from which comes benzine, a base for many cleaning fluids.

Carbolic Oil

Carbolic acid, used as a sterilizing agent;
Toluene, used as the base of such widely dissimilar products as T. N. T., perfumes, saccharine, dye-stuffs and local anaesthetics;
Cresylic acid, used as the base of many disinfectants such as lysol, and also in many so-called "safety" explosives.

Creosote Oil

Creosote, used in medicine, as a disinfectant, for sheep-dipping, and to preserve wood from decay.

Green Oil

Anthracene, used as a base for the making of brilliant orange, red and blue dyes, and as a medicine for skin diseases.

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Pitch
used in road-building, and for roofing and water-proofing work.

All this, and the thousands of products derived by further treatment of the coal tar, are wasted as coal is now burned in the power plant. Think of it, when you grumble at the size of your coal bills! And then, because the commercial solution of this problem is not yet with us, consider what you can do immediately to get greater returns from the money invested in fuel.

You will find plenty of room for improvement all along the line. With a difference in heat-utilizing efficiency of more than 8 to 1 in favor of the best commercial power station practice, as compared to the average industrial power plant, there is every chance in the world for the latter to double, or even treble its coal burning efficiency with very little effort.

With fuel costs ranging from 50% to 80% of the cost of producing power, any substantial reduction in the total amount of money spent for fuel reacts immediately upon the costs of manufacturing.

There are two ways of spending less money for fuel without sacrificing any element of power produced:

1. Burn a cheaper fuel, or

(*Continued on page* 58)

Fig. 10. Big bituminous lumps running into the railroad cars. After grading, sorting and picking, these large sizes of soft coal are carefully loaded into the railroad cars in such a manner as to prevent further breakage.

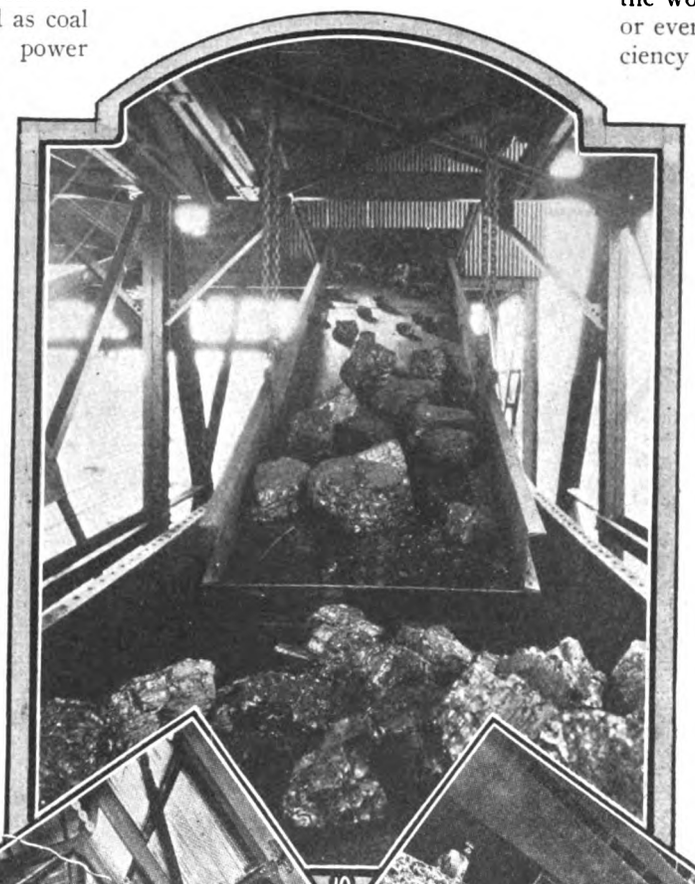


Fig. 11. Picking over the larger sizes of bituminous. This slow-moving apron conveyor handles the huge lumps of soft coal as gently as eggs—for if it is broken up unnecessarily its market value becomes distinctly less. The pickers cull out the "bone" as it passes.

Fig. 12. A "doughnut" picking table in the bituminous field. The ash content of the coal is lowered materially by this operation, which may be performed either manually as shown here, or by means of sorting machines.

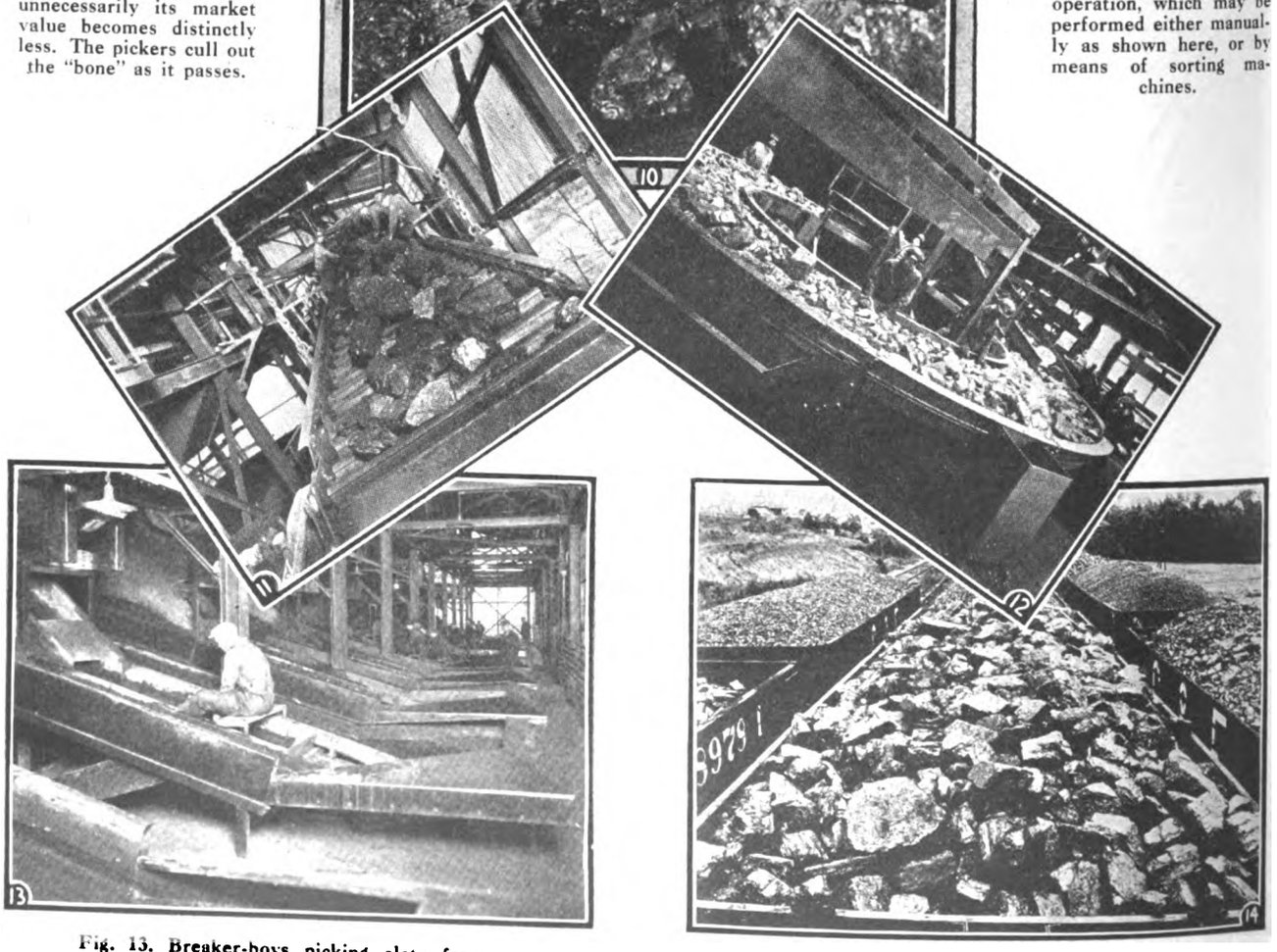


Fig. 13. Breaker-boys picking slate from anthracite. As the coal comes down through the breaker-chutes, boys, sitting over the chutes pick out and throw into refuse-slides the slate and "bone," or rock. (Photo Courtesy of Coal Age)

Fig. 14. Part of one day's output of a semi-bituminous mine. This coal ranges midway between the "hard," smokeless coals of eastern Pennsylvania and the "soft," smoky coals of western Pennsylvania and Ohio.

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Keeping Tabs on Small Tools and Equipment

THE man who is charged with the responsibility of machine tool operation needs to have in addition to the five usual senses, a sixth sense—the sense of proportion.

He needs this particularly with respect to the little things, under which head may be included small tools and shop supplies.

These so-called little things are mighty important in a successful operation of the machine department. They do not cost a great deal of money to buy in comparison with the heavy tools or fixed equipment. Thus they sometimes escape both care and scrutiny.

(*Continued on page* 82)

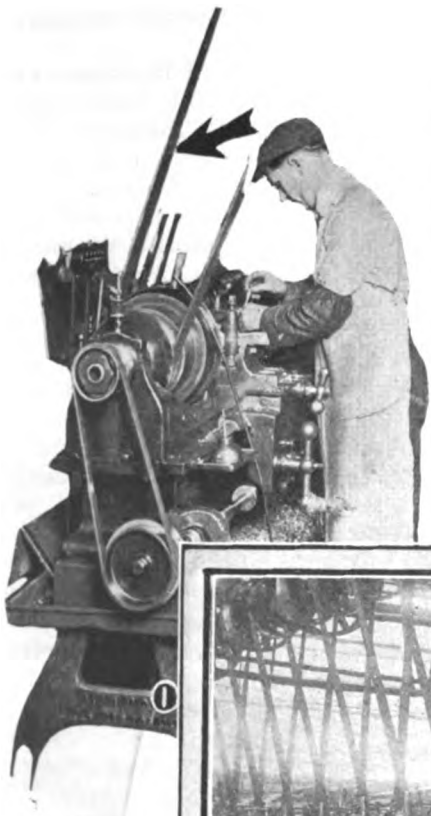


Fig. 1. Machine tool production is dependent upon belt pulling power—and staying power. An inferior belt is no bargain and you could not afford to accept one even as a present.

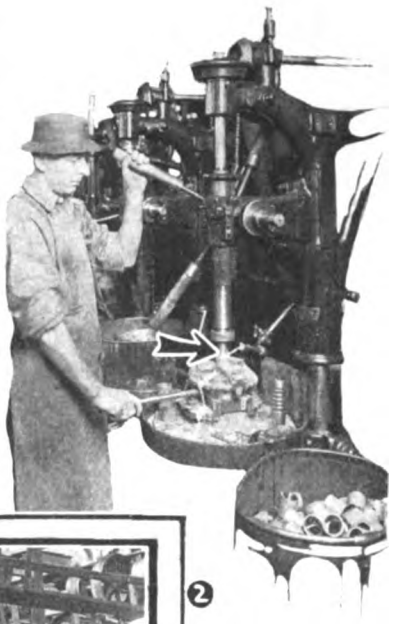


Fig. 2. The cost of a reamer is not measured by its price, but by the number of holes it will ream before losing its accuracy. Do you know how many holes you get for a dollar?

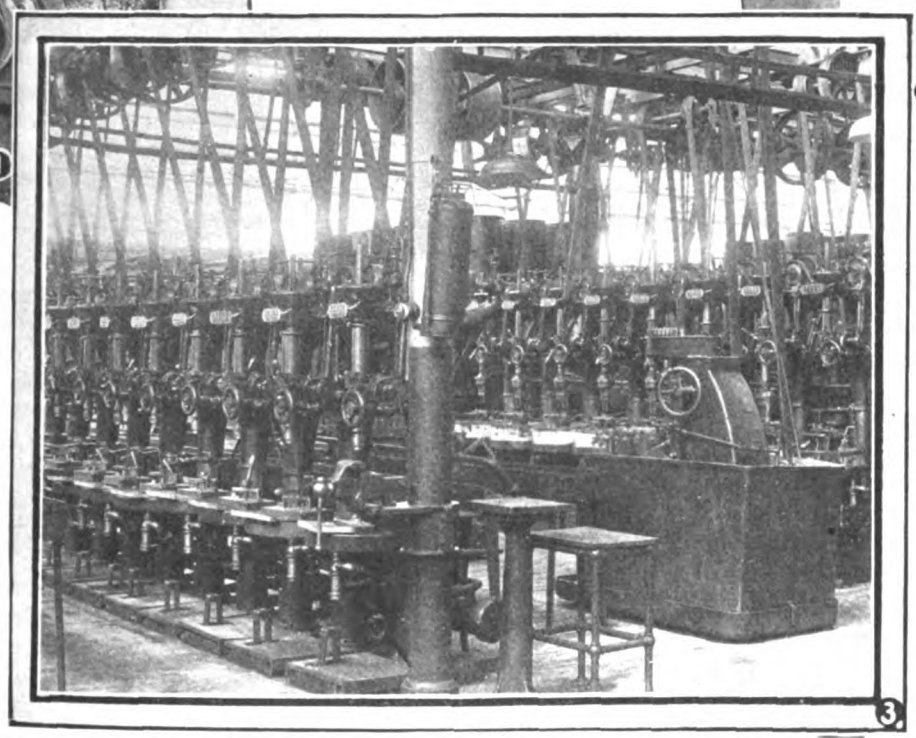


Fig. 3. Many thousands of dollars were invested in machine tools to procure this drill press equipment. But its performance, and the dividends it pays depend on simple little twist drills, without which the big machine is helpless.



Fig. 4. Welding torches should be regularly inspected and kept in first class repair, not because they represent a big investment, but because poor or disabled welding equipment hampers the output of high priced welders.



Fig. 5. Neglect of grinding wheels is a common cause of underproduction and high costs. Are your wheels properly selected for their work and are they kept running at the proper speed?

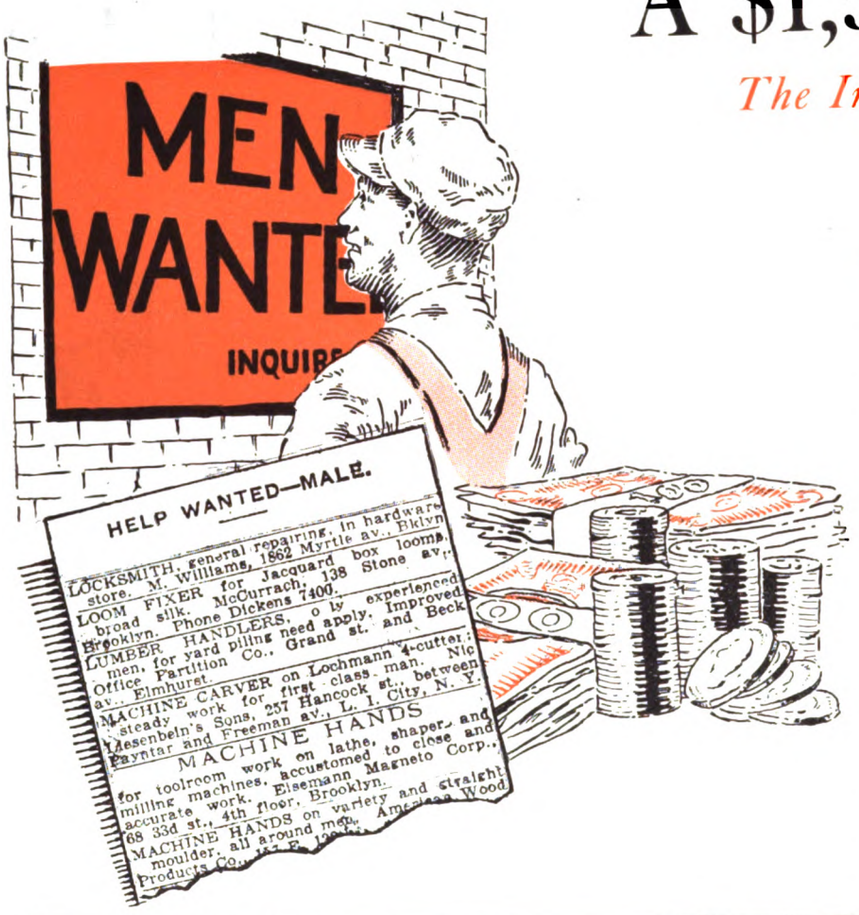
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A $1,500,000,000

The Immense Economic Loss

By Harold

Graphic Visualization by



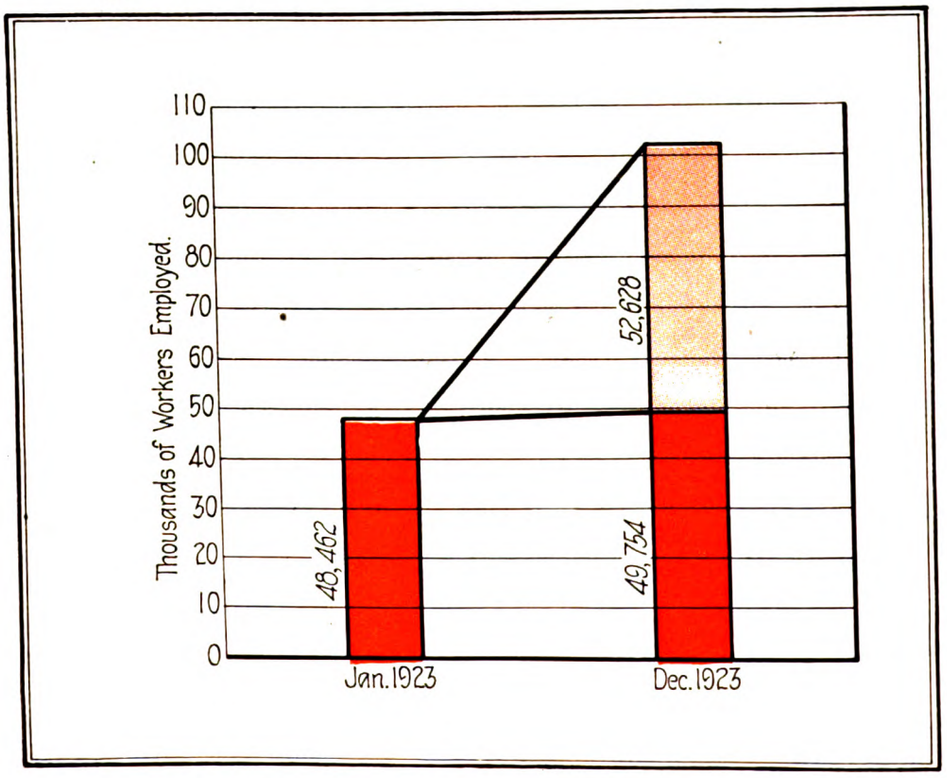


Fig. 1. In a group of ten factories selected for investigation, there were 48,462 employed at the beginning of 1923, and 49,754 at the end of that year. The number hired during the year was 53,920; yet the net increase resulting was only 1,292 employees.

THERE are two factors in industry: the material and the human. The material factor, consisting of tools, machines, raw materials, processes, buildings, has been the focus of a large per cent. of the industrial brains of this country.

Many methods for reducing power production costs have been devised; varied methods of material control and production control have originated and are now used extensively in modern industry; tool engineering and time study methods have received a large amount of attention because of their direct effect upon production efficiency.

On the other hand, the human factor has been slighted by many manufacturers as far as any scientific, constructive policy or plan of labor handling is concerned, notwithstanding the fact, that all employers are unanimous in agreeing that the problem of labor turnover is worthy of consideration.

At present, we are suffering a great economic loss due to workmen moving from job to job. In order to maintain in the United States a working force of 40,000,000, it is estimated that 50,000,000 workers are hired annually, in other words a turnover of 125%. This turnover is partly beneficial, as many advance themselves each time they move, but the greater number of such cases are but mere illusions.

My interest aroused because of the large turnover, I sent letters of inquiry to various employers, seeking information as to the extent and approximate cost of their labor turnover.

One employer in reply to the question on the cost of labor turnover said, "We take the cost of maintaining the employment department and prorate it over the various departments." In other

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Tax on Industry

Due to Labor Turnover

Fischer
Frederick H. Peard

words, no employment department—no cost of labor turnover. This man failed to take into consideration the items of decrease in production, cost of instruction, breakage and damage caused by new men, including actual breakage, accidents to workers, wasting or destruction of material, delay of work or stoppage of machine, and the cost of idle machinery and equipment. These latter items comprise a much greater part of the turnover cost than the expenses of the employment department, consequently this company knew very little about how much their labor turnover was costing them.

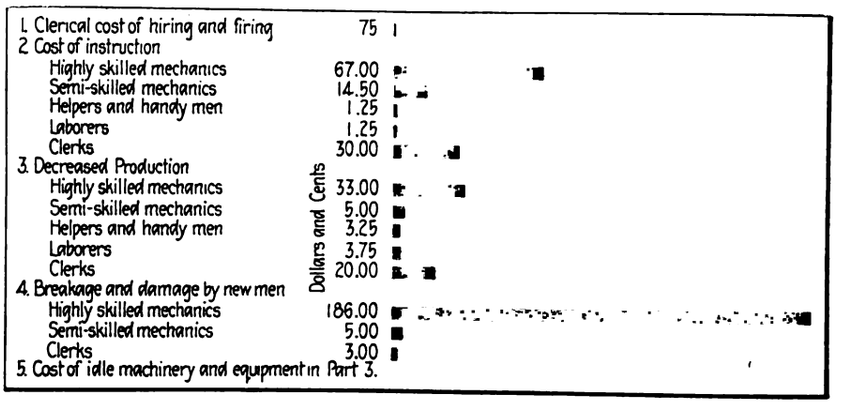


Fig. 2. A graphic presentation of the cost of replacement per inexperienced man hired, as estimated by an employment manager in the shoe industry.

Many employers replied that they knew that labor turnover was costly, consequently were trying to reduce it. Another employer replied that they give less attention to records and more attention to results, therefore, they had no information or idea concerning what their labor turnover was costing the company. Yet every system must have records.

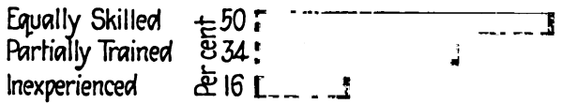


Fig. 3. In connection with Fig. 2, it is interesting to note that only 50% of replacements are by equally skilled workers, and 16% are inexperienced—the most costly type.

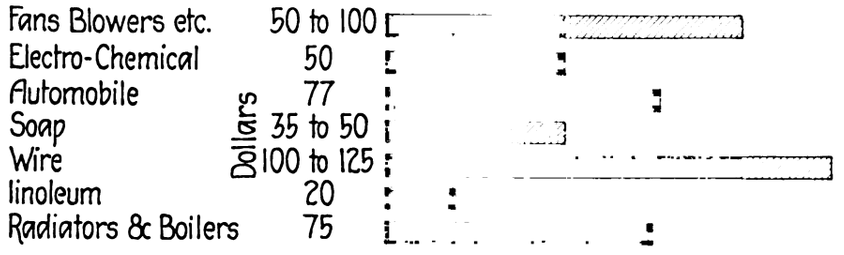


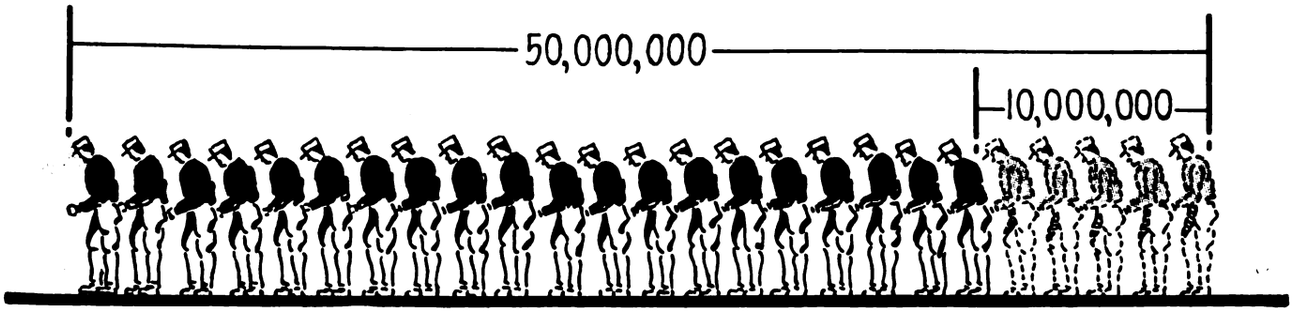
Fig. 4. The average cost of replacement of employees as reported by specific plants in a variety of industries. Apply even the lowest estimate to the case cited in Fig. 1.

These employment managers recognized that a large economic loss was being entailed without realizing its real extent and nature. Much has been written in recent years concerning this problem. Many surveys have been conducted and the results obtained therefrom, published, yet it is still shrouded with a veil of vagueness in the eyes of many employers.

In discussing the problem of labor turnover, practically everyone agrees on the method of figuring labor turnover up to the point that it is some kind of change of help per year divided by the normal working force of that year; but beyond that point, all is in disagreement. However, zero

(*Continued on page* 34)

Fig. 5. Below—In order to maintain in the United States a working force of 40,000,000, it is estimated that 50,000,000 workers are hired annually; a turnover of 125%, only a small portion of which is explained by advancement.



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The Modern Industrial Doorway

Wide Adaptability of the Steel Rolling Door

By Milton L. Cornell

TO get in or out of a building conveniently there must be doorways.

Eliminating the proverbial saw mill, doorways are usually provided with doors.

The functions of doors are to keep out the cold, storms and winds. They are asked to prevent the entrance of thieves and unauthorized visitors. In modern plants they are expected to prevent the passage of fire, either from without or within. The designer, contractor and owner has a number of types of doors from which to choose.

The original door was probably a stone rolled to the mouth of the cave. As caves lost their vogue, various wood barricades were used, but eventually metal hinges were developed and wood swing doors came in.

The hinged wood door is the best known. Its original cost will probably be the cheapest for some time to come. The first improvement was a metal covered door—steel, preferably galvanized or tinned, fitted over a wood core.

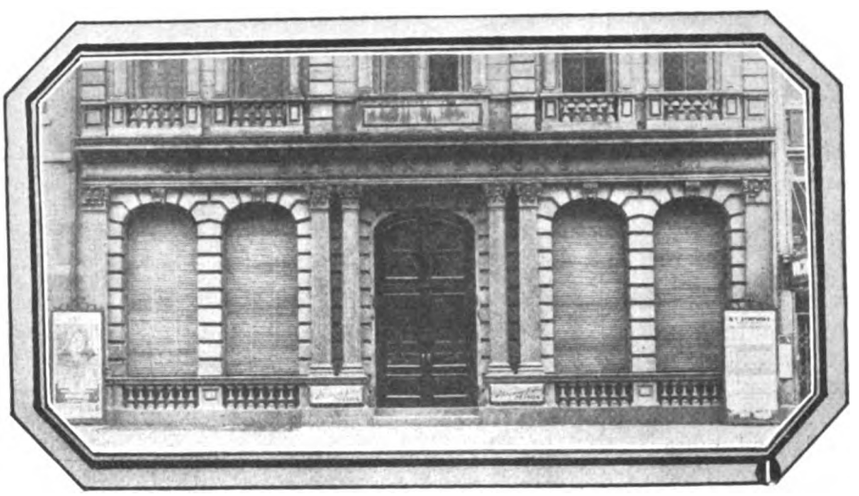


Fig. 1. These hinged slat rolling doors were installed in 1866—58 years of service.

Then came the all steel swinging door, and later the hollow metal swing doors, attractively enameled and finished.

The sliding doors make up the second most important family. Doors, sliding, or running, on an overhead track, or on the sill, may be made in the same materials as the swinging doors.

The most modern doors are the interlocking slat steel rolling doors, and the bifold doors. They operate vertically up and down, instead of swinging or sliding. In this class belong the special purpose two piece balanced elevator doors.

First Cost

Wood doors are the cheapest, with the sliding type the more expensive to install. Metal covered doors come next, after them all steel doors, of light construction, and finally the vertically acting doors. Wood doors,

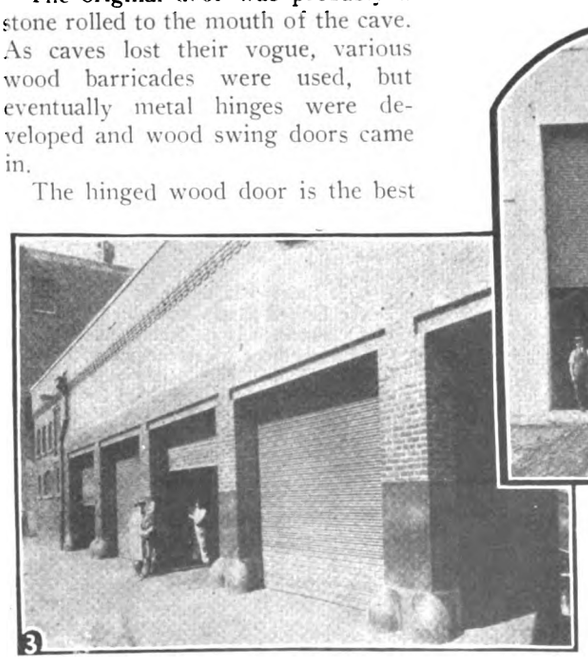


Fig. 3. The space-saving feature of the rolling door is valuable in warehouse or shipping room.

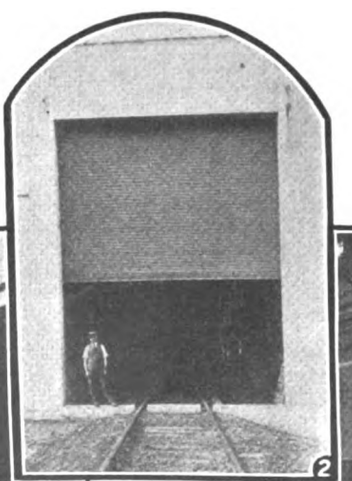


Fig. 2. A railroad door entrance, 15x22 feet, protected by a steel rolling door.

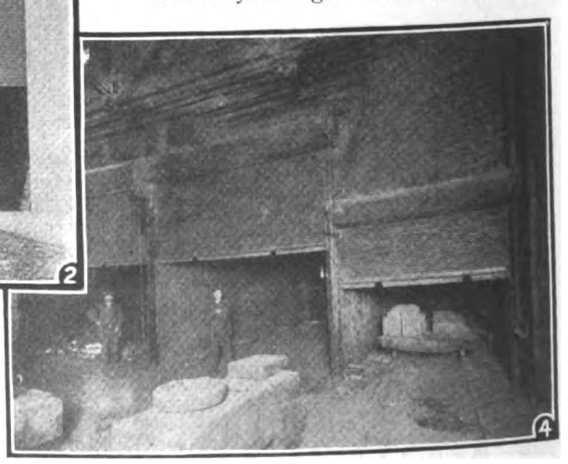


Fig. 4. Steel rolling door, or curtain, installed on core ovens in a foundry.

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with favorable sizes and conditions, may be installed for less than one dollar a square foot. Metal covered doors will cost more than wood, and light all steel swinging or sliding doors may be installed for about one dollar and a half. The vertical acting doors cost slightly more. The conditions for installation and the number of duplicate openings will, of course, largely affect the exact cost.

Durability and Maintenance

Wood doors are not fire stops nor effective protection against theft. They deteriorate rapidly in the weather, are easily marred and age quickly. Metal covered doors last longer than wood, and when new, are good fire stops and more effective against theft. Under adverse conditions, however, the wood core in these doors has deteriorated rather rapidly and left the light steel covering unsupported. The metal covering is generally of light gauge and mars easily.

The all steel doors are fire stops of the first-class and the best protection against theft. If regularly painted, barring accident, they will last for many years. Steel rolling doors have advantages peculiar to themselves in the way of maintenance and repair, which are explained below.

The Principle of Steel Rolling Doors

A common window shade most easily explains rolling doors. The shade portion is the curtain or door proper. The curtain is made up of a series of rolled steel interlocking slats, each two to three inches wide. The slats are shaped to slide into engagement lengthwise, will not then pull apart, and form a flexible steel curtain which will wind closely around a shaft.

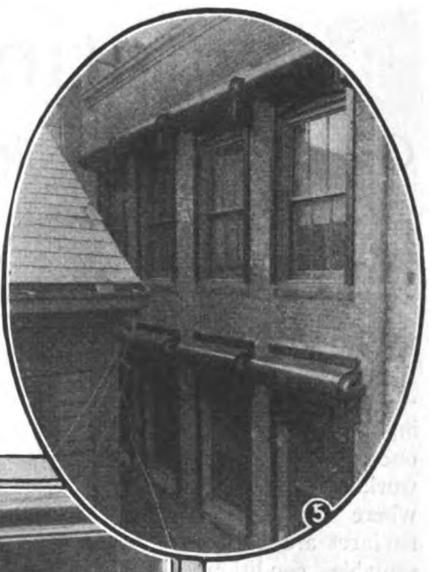
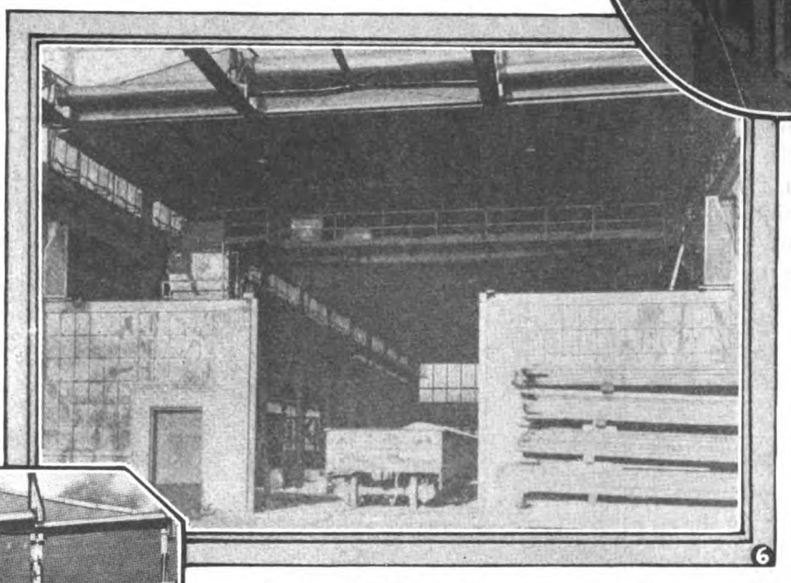


Fig. 5. Above is shown the application of exterior steel rolling shutters, equipped with automatic release, to protect in case of fire.



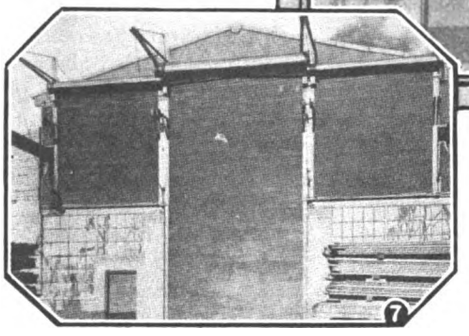


Fig. 6 and 7. Showing how a large crane-way space can be completely protected, without interference when the doors are not needed.

The curtain is 22 to 16 U. S. gauge in thickness of galvanized steel and weighs 2½ to 5 pounds per square foot.

The horizontal shaft is equivalent

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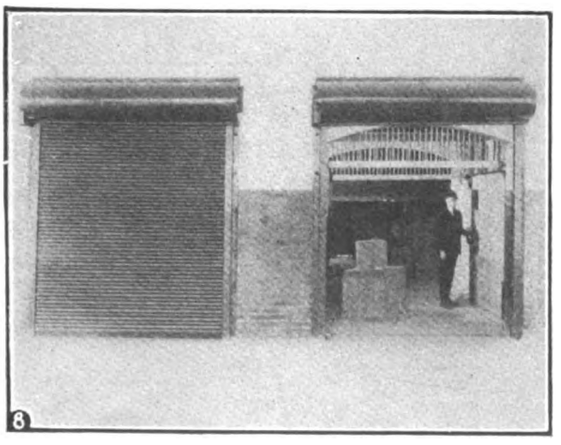


Fig. 8. Steel rolling door, as applied to an elevator shaft as a fire door.



Fig. 9. Loading-platform doors; which leave a maximum opening for trucking, yet are weather-tight when closed.

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Painting for Protection

Combating Decay and Corrosion Arising from Manufacturing Processes

By Roy C. Sheeler

(Illustrations from "Save the Surface" Campaign)

NO one will deny the invaluable part played by paint and varnish in the *appearance* of industrial property. Practically every one is sold on the advantages of working in pleasant surroundings, where inside and outside surfaces are kept in a presentable condition. This article deals with the use of paint and varnish from a *protection* standpoint, with a discussion of ways and means of combating the ravages of rot and corrosion due mainly from exposure and from conditions arising from manufacturing processes.

As far as exterior wood surfaces are concerned, the chief cause of decay is the action of the elements in the shape of exposure to the sun, rain, wind, cold, heat, etc. Unpainted wood permits ready entrance of moisture and dampness, and when such surfaces are exposed to the sun's rays, they have a tendency to draw out the moisture content. This causes serious cracking and generally weakening of the structure. During excessively wet weather, unprotected wood surfaces absorb so much moisture that rot is the natural consequence.

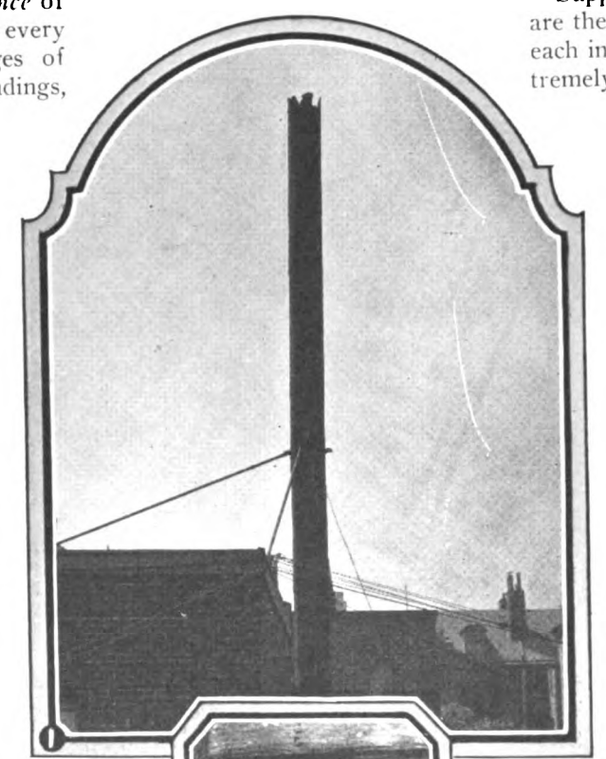


Fig. 1. A steel chimney whose years of usefulness have been materially shortened by neglect of painting.

Supplementing normal exposure are the peculiar conditions existent in each industry, many of which are extremely hard to fight. Chief among these is contact with dust, dirt, smoke and soot, which leave a deposit upon all surfaces. While in most cases this deposit has no extremely bad effect upon wood surfaces, it does mar their appearance and thus causes repainting to be necessary at much more frequent intervals. Quite recently a number of experiments have been made by the Institute of Paint and Varnish Research at Washington to determine the relative dirt-absorption qualities of flat vs. gloss paints. While these tests are not conclusive, they rather upset some pet theories and point to the fact that flat finishes absorb *less* dust and dirt than gloss surfaces. In a flat finish, there is practically little pigment exposed, most of the oil having been absorbed by the surface over which it is



Fig. 2. What happens when wood siding is not protected against the weather.

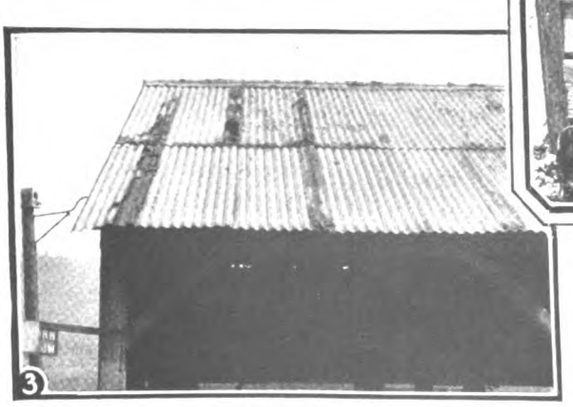


Fig. 3. This galvanized iron was not painted, on the theory that galvanizing alone was sufficient protection.

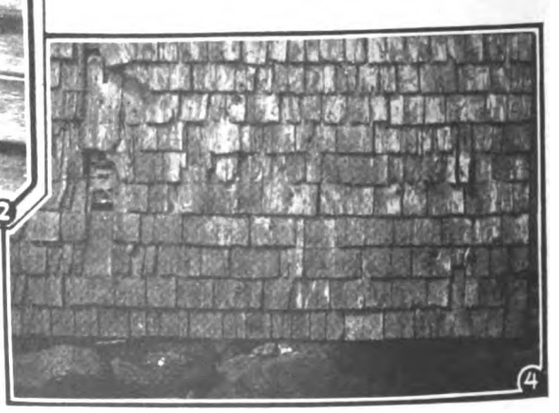


Fig. 4. Shingle stains, with their chemical constituents designed to protect the wood, prevent this kind of thing.

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applied. While dust and dirt undoubtedly find an easier lodging place on a flat surface than on a gloss, it is readily removed by dusting or by blowing upon the surface. With a gloss finish, what dust and dirt fall upon it is largely absorbed by the oil that is present and the foreign particles cling very tenaciously to the surface, making it much more difficult to clean it. This fact has an important bearing upon the choice of a wall and ceiling finish for industrial plants, seeming to give preference to the flat finish. The light-reflecting properties of interior finishes will be greatly diminished by the accumulation of dust and dirt. And usually it is far easier to refinish a surface finished with a flat white than it is to apply a new coat to a glossy surface. Where a flat finish is preferred by one manufacturer, another may wish a gloss, so that the consumption of whites is rather evenly divided between flat and gloss.

In many industries the presence of acid and gaseous fumes has a serious effect upon the appearance and durability of paint on wood surfaces. In some localities it is practically impossible to use a paint containing carbonate or sulphate of lead without it turning black or discoloring in some other manner, as well as chalking rapidly and early disintegrating. Anyone living in the vicinity of the Passaic River in New Jersey, especially during the excessively dry period of a year or two ago, will have

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Fig. 5. An iron pipe and wood post fence with which nature has had full sway. Paint would have postponed replacement indefinitely.

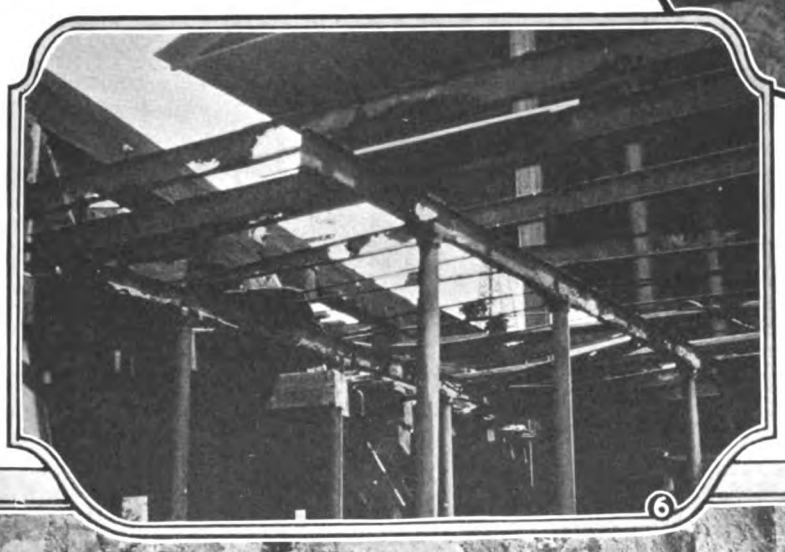


Fig. 6. Steel beams and girders which have been totally destroyed through neglect.



Fig. 7. Above—Showing how rust attacked an unpainted steel girder imbedded in concrete.

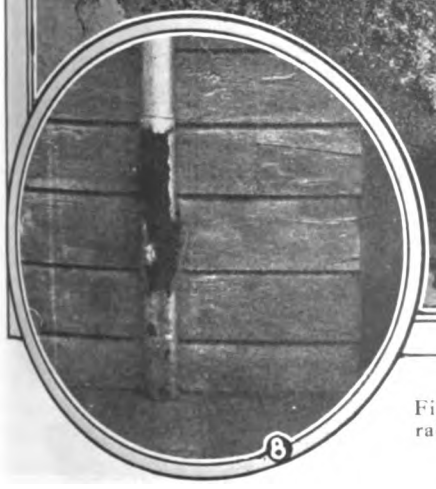


Fig. 8. Such cases as this—a neglected rain-spout—are all too common sources of waste.

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How Applied Ingenuity Has Multiplied Production

Steps in the Development of Automatic Machine Tools

By A. R. Kuzelewski

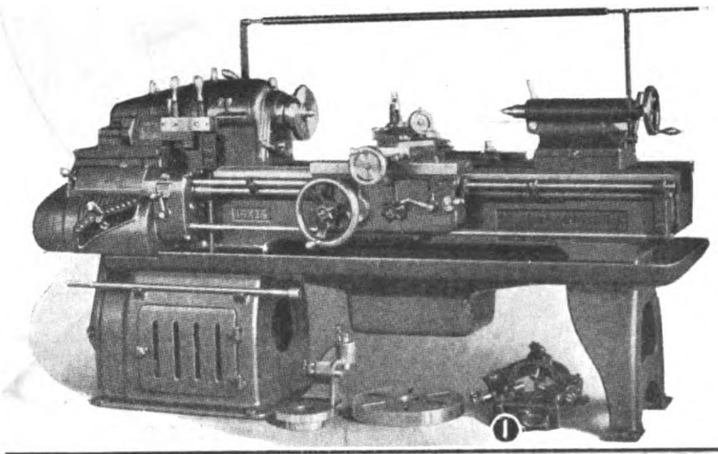


Fig. 1. The up-to-date engine lathe, an outgrowth of the previous simple foot-power lathe. There are many modifications and types, but the principle is the same in all, as regards automaticity.

SOME short sighted labor leaders claim that automatic machinery is detrimental to the welfare of the working classes, because when everything is automatic, there will not remain enough work to go around. We know from statistics computed by the Department of Agriculture that there are more horses now in the United States than there was twenty years ago, regardless of the fact that during the last twenty years more than fifteen million horseless vehicles were built; the amount of lumber used in shipbuilding has greatly increased during the last decade, although ships nowadays are made of steel plate; on the other hand, if we did not have highly improved machinery for making nails, for example, and had to produce them the old fashioned way—all the working population of the United States could be set to making nails, and yet their production would not be sufficient to satisfy the demand.

The metal industry, and especially the manufacture of duplicate parts such as parts of typewriters, motors, sewing machines, cash registers, house and kitchen utensils, presents a great variety of perplexing problems, and it may therefore be of general in-

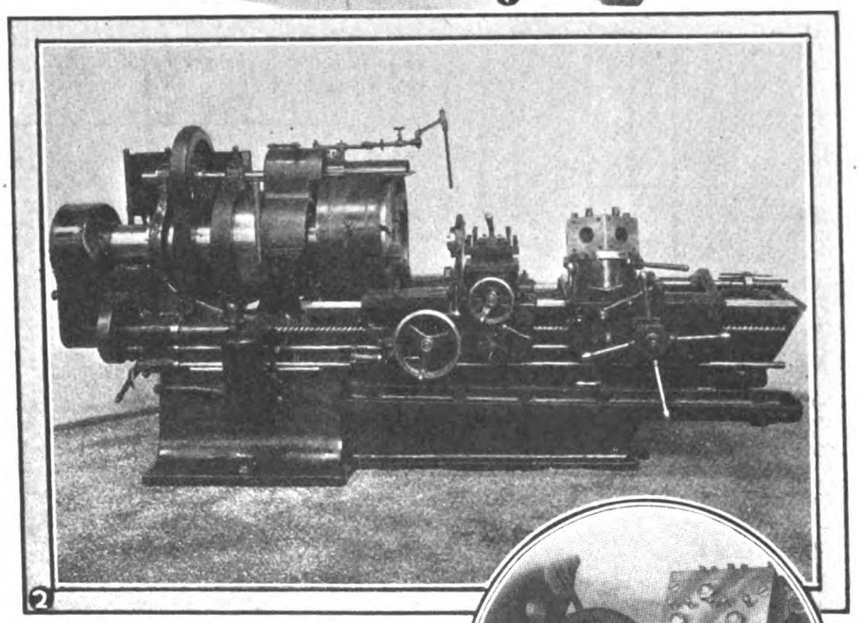


Fig. 2. The next step toward automatic operation came with the turret; in consequence of the demand for quantity production of interchangeable parts.

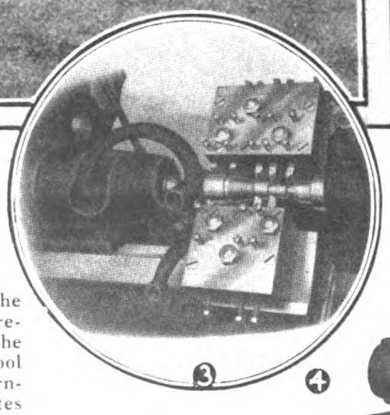


Fig. 3. Another advance over the simple engine lathe, for work requiring only turning, lies in the application of the multiple tool idea. This close-up of the turning of a steering spindle illustrates the principle.

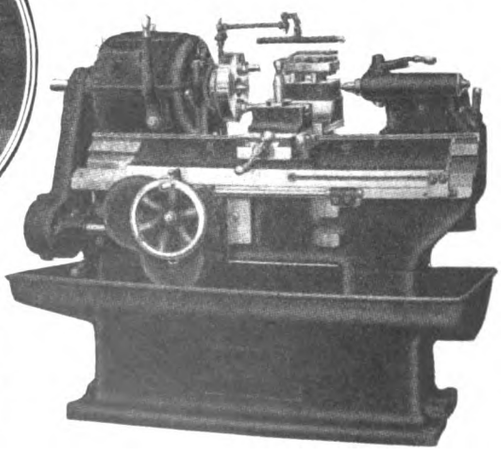


Fig. 4. A number of different makes of these multiple tool lathes have been developed recently. They have their distinct province, separate from that of the turret lathe.

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terest to follow the development of metal working production tools step by step from their original beginning to the modern highly specialized fabricating automatic machines. Such a short analysis, showing the gradual development of the idea and principles of automaticity in manufacturing duplicate parts, will enable us to see what has been done so far and how it was accomplished.

If we analyze our shop operation we see a great variety: planing, milling, drilling, turning, boring, recessing, grinding, gear-cutting, slotting, and the like; by looking closer we notice that most of them are generating cylindrical surfaces—drilling, boring and turning, and this is the reason why the lathe in all its forms and modifications is the most important and consequently the most improved of all production machines.

The original lathe consisted of a bed with headstock and tailstock fastened on same—the headstock driving the work from a foot-operated treadle. The cutting tool was moved by hand and was just supported by a simple block.

The first step forward was power on the spindle, transmitted by means of a belt from a runnning pulley outside of the machine; and to this day this type of lathe as originally conceived is being used for performing some simple operations like spinning, polishing, and the like.

The first step toward eliminating the human element was the power feed: the tool support or tool holder was securely fastened on a compound carriage which could move in both directions, lengthwise and crosswise, being connected to a lead screw which in turn derived its motion from the revolving spindle through a train of gears. The first automatic feature meant that the operator had to secure the work on centers, in case of a shaft being turned, or on his faceplate, if the work was of different nature; set his cutting tool in a certain position; and start the machine, which would then move the tool longitudinally when turning and laterally when facing.

All other improvements, such as speed changes, chucks and holding devices, different attachments were a great accomplishment in the way of saving time and energy; they did not, however, add anything towards making the machine more automatic.

With the progress of our industries, with constantly increasing demand for pieces of the same description which would interchange, pieces like bushings, studs, screws,

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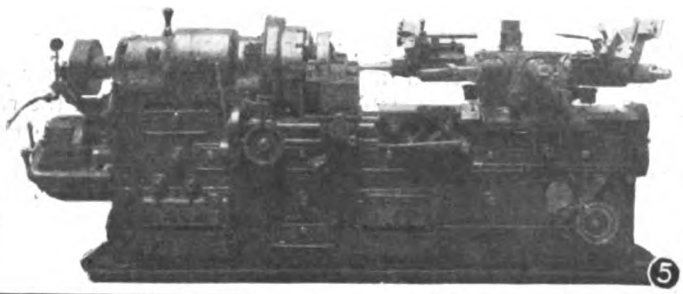


Fig. 5. The automatic chucking lathe is an improved turret lathe, with an additional mechanism which advances the turret under power feed, returns, and revolves it to the next position.

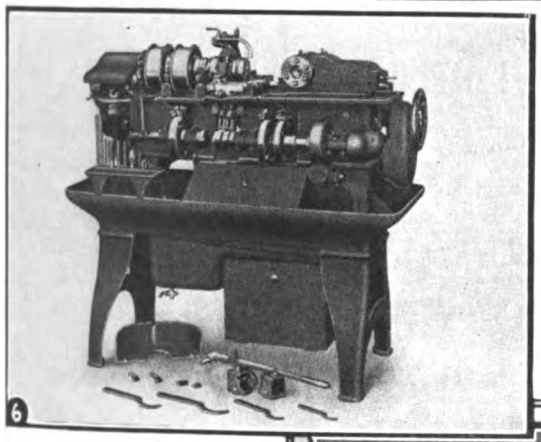


Fig. 6. The automatic screw machine was made possible by the combination of two ideas: (1) the turret holding several tools set in advance, and (2) the mechanism for feeding the turret and indexing it on the back travel.

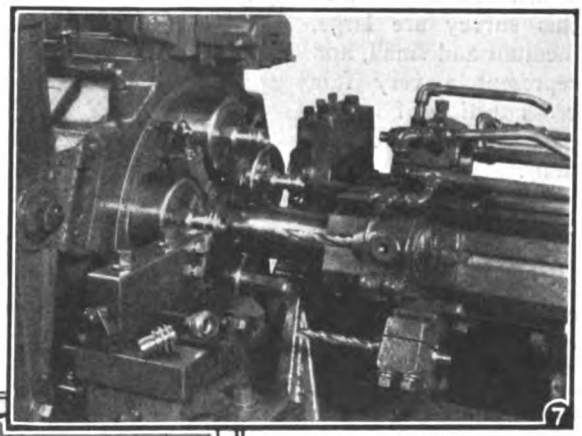


Fig. 7. In the multi-spindle automatic machine, five spindles (or as many as provided on the particular machine) revolve, each holding a bar of rolled stock; five tools advance and perform separate operations, simultaneously; and after each operation the spindles make one-fifth revolution, for the next operation.

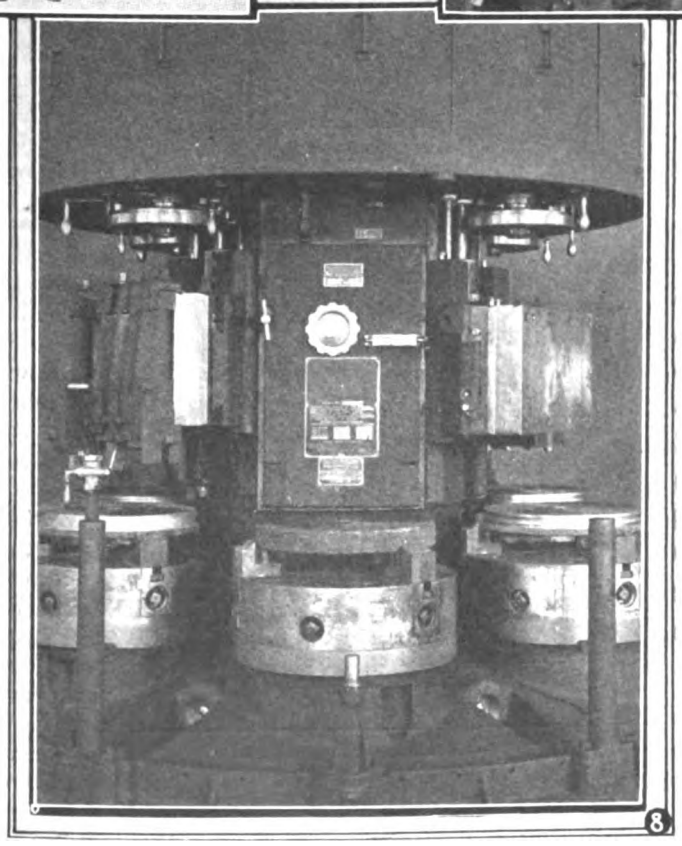


Fig. 8. The station type automatic machine represents the same general idea as the multi-spindle automatic, but worked out in a radically different way.

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Facts and Figures for the Power Man

As Disclosed by a Survey of Representative Plants

THE following facts and figures which are of interest to every one who operates or has jurisdiction over the management of an industrial power plant were obtained through a questionnaire sent out by our editors. The plants which are included in this survey are large, medium and small, and represent a very fair cross section of industrial power plant conditions.

One of the first facts which we discovered was that very few people know or have an exact means of finding out how much their power costs them, unless indeed it is bought from a central station, in which case the bill is presented with unfailing regularity. Where power, however, is generated "at home" our statistics show that scarcely one out of four plants has a system that will get the real facts.

The graphical chart shown below on this page tells this story in no uncertain terms. It shows that out of 152 industrial plants only thirty-nine have the means of finding out accurately what their power costs them. The remainder either guess at it by obtaining what they call "general power costs" or else neither know nor guess.

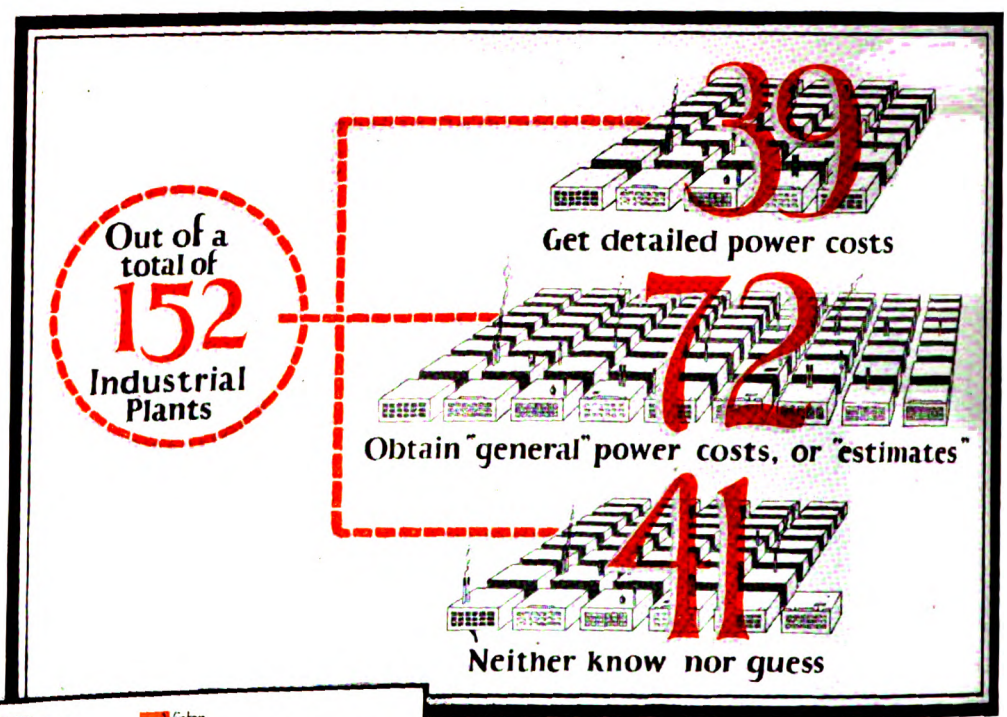


Fig. 1. The chart at the right shows that comparatively few of our industrial plants obtain detailed power costs. Most of them guess at it and a large number neither know nor guess.

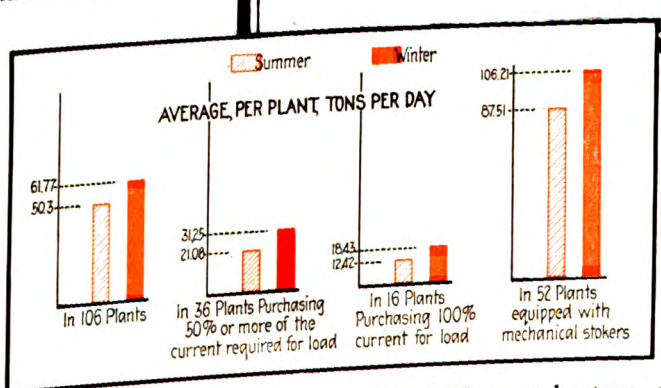


Fig. 2. Above is the average daily summer and winter coal consumption as reported by 106 American industrial plants. Notice the comparatively uniform rate of increase of winter over summer demands.

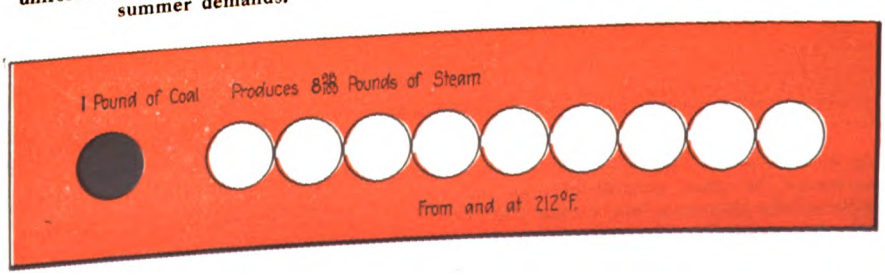


Fig. 3. How much steam does the average industrial power plant get per pound of coal. Our survey shows, as indicated below, nearly nine pounds of steam (from and at 212 deg. F.) per pound of coal.

We have called attention repeatedly in past issues of INDUSTRY ILLUSTRATED to the shameful waste caused by inefficient power plant methods. Here we believe is the big reason why such wastes are permitted. Without a proper cost system, the plant manager is not aware of what he is spending or what he should spend. The first step therefore in checking these wastes is to put in a proper power cost system. This is not a difficult job. You will find a simple yet effective system described in the February issue of INDUSTRY ILLUSTRATED.

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Power is one of the chief raw materials used in almost every industry.

If plant managers would make it a practice to regard power as a raw material—which it really is—this loss would not long continue. It would be watched just as carefully as iron or steel or copper or other expensive materials going into a product are watched to prevent not only excess in first cost but waste in use.

For there is a great deal of waste in the utilization of power as well as in its production. As a rule there are no restrictions attached to it in the factory. Every one feels free to draw upon the resources of the power plant without check or limit. You do not have to sign a requisition for this or that number of horsepower hours or kilowatt hours that you would have to sign to obtain this or that many sheets of steel or nuts, bolts, or pipe fittings. And while, of course, we cannot seriously recommend that a foreman be required to make out requisitions for the amount of power that he contemplates using from day to day or week to week, there should at least be some check upon his consumption. This may take the form of tests made from time to time covering the power requirements of various machines, these tests being used to establish standards of power consumption. Where electrical distribution is employed, the use of department recording watt-hour meters will provide the necessary check. Where current is drawn to excess, investigation will frequently show excessive friction or other preventable causes of power waste.

Standards of practice in power production and consumption are equally desirable. On these pages we are showing a few of the standards indicated as average in the plants covered by our questionnaire. It will be well to check your own practice against these standards to see if you are doing as well or better than the average industrial plant. The average plant, for example, evaporates very close to nine pounds of feed water "from and at 212 deg. F." per pounds of average coal as burned. Another important check on combustion efficiency is the CO_2 content of the flue gases. The average as shown by our questionnaire is close to 10.9 per cent. The higher this percentage the more efficient the combustion. When it is low it is almost a sure indication of air leaks in the brick work of the furnace setting which causes excess air, cools off the fire and wastes coal.

The comparison of steam engine and steam turbine equipment in the eighty

(*Continued on page 94*)

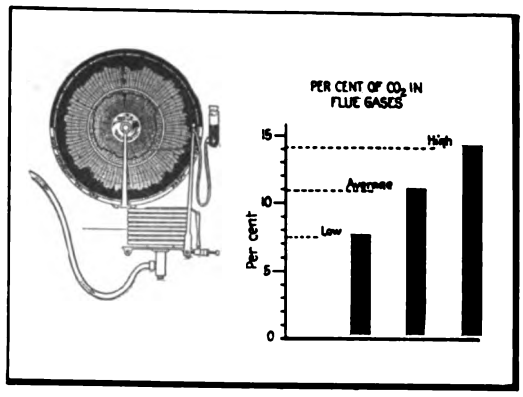


Fig. 4. The CO_2 content of the flue gases is a sure indication of the combustion efficiency. Progressive plants make constant or periodical tests on CO_2. The practice as revealed by our survey is shown above.

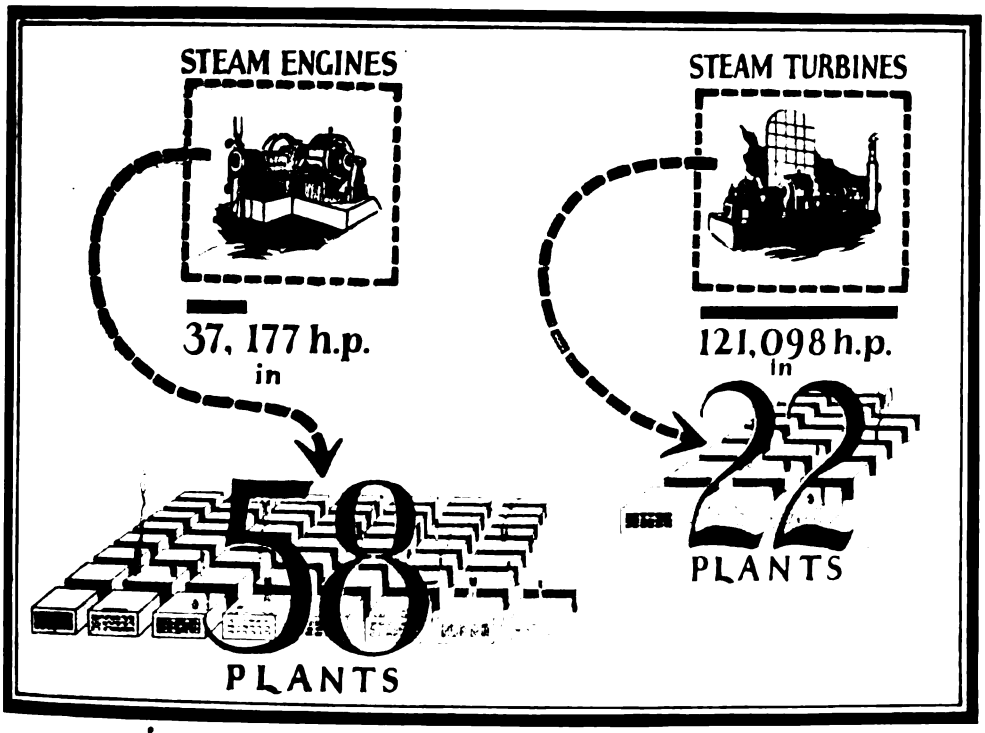


Fig. 5. The interesting chart at the left shows the relative horsepower developed by steam engines and by steam turbines in eighty American industrial plants.

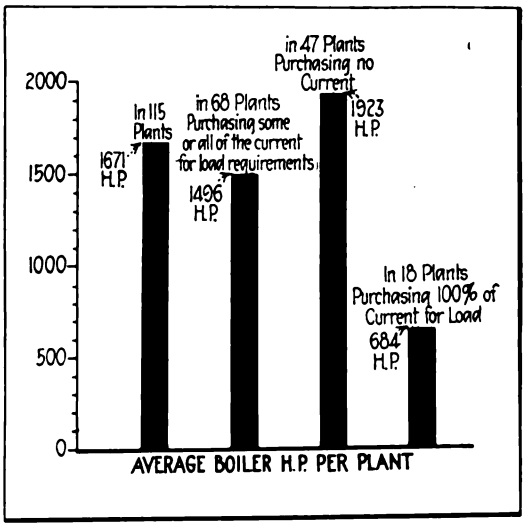


Fig. 6. The average boiler equipment expressed in boiler horsepower in various classes of industrial power plants is shown in the above diagra . The purchase of electric current by no means abolishes the boiler.

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Does Utility Forbid Beauty?

Designer of Great Automobile Plants Was a Pioneer in Combining the Two

By Dwight G. Baird

IN perhaps no other city in America are there so many manufacturing plants that have carried quantity production to the "n'th degree" as there are in Detroit.

In perhaps no other city in America are there so many manufacturing plants that are models of beauty and refinement as there are in Detroit.

Not only so, but the same Detroit plants that are known the world over for their amazing production schedules are the very ones that are models of beauty and refinement.

Name a few of them. Ford's comes first, of course. What is the impossible to others is the commonplace to Ford's. The Ford industries are the marvel of the industrial world, considered from a production standpoint, yet it is hardly any exaggeration to say that no other manufacturing company in the world owns so many handsome plants as does the Ford Motor Company. Then there are other world-famous automobile plants such as the Packard, Hudson, Paige-Jewett, Dodge, Cadillac, Maxwell, and Studebaker, and the plants of Continental Motors, Morgan and Wright, and The Detroit News, all of which are handsome as well as efficient.



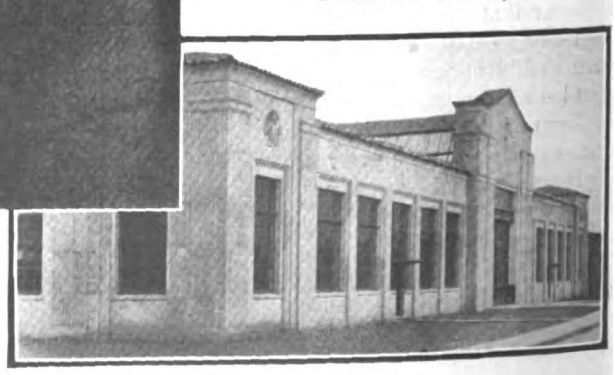
There are many handsome office buildings, banks and clubs in Detroit, too; notably, the General Motors Building, the twenty-four-story First National Bank Building, the National Bank of Commerce, the Security Trust Building, the Detroit Athletic Club, the Country Club, and the Detroit Golf Club. All are beautiful buildings and with their beauty is combined a maximum degree of utility.

That so large a proportion of the manufacturing plants and public buildings in Detroit are noted for their handsome architecture as well as for their efficiency is due in part, of course, to the fact that they are new, but this alone does not account for their existence. There are many new buildings that are neither handsome nor efficient. Neither does it account for the use of reinforced concrete in the first Packard plant that was built in Detroit, nor for the use of stone on the outside of the Detroit News plant.

To one man is due most of the

(*Continued on page* 45)





Albert Kahn, a pioneer in designing manufacturing plants that would be handsome as well as efficient. Born in a small town in Germany, one of eight children, he came to Detroit with his family at the age of eleven, and—as he says—"grew up with the automobile industry."

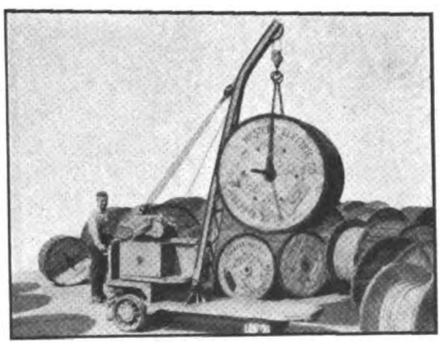
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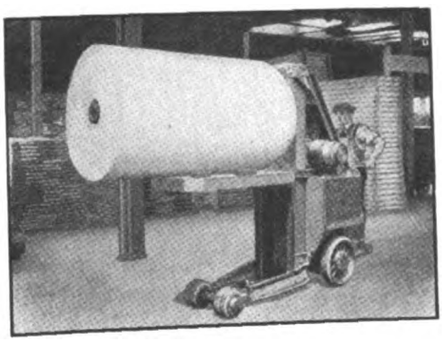
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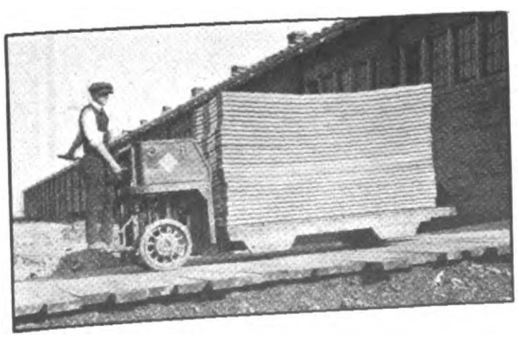
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(*Continued from page 23*)

as the point of perfection is used as basis of all methods.

Of the various interpretations of labor turnover, the simplest and most accurate method, I believe, is the ratio of the number of entrances or exits (which ever is the smallest) to the average working force of the plant for the stated periods.

As stated above, many disagreements occur as to the method of rating labor turnover. Some use the number of entrances as the numerator, while others use the number of separations as the numerator of the fraction, still others use the number of replacements. Concerning the denominator, some use the average number on the payroll, totaled on the basis of the number on the payroll at the beginning of each week or each month, while others use a closer approximation, by having as the denominator the actual men working full time and totaled day by day, or using as some suggest, the number of 3,000 hour workers on the payroll.

From the factories under investigation, I have selected a group of ten for presentation. These ten were chosen because they seemed to me to be representative because of the location, size and nature of their business.

These plants were located in seven different states in the eastern and central parts of the country. The products manufactured in these various factories were—Fans, Blowers, Electric Motors, etc.; Shoes; Chemicals; Linoleum; Edible Oils, Soap, Glycerine; Rubber and Canvas Footwear; Tires, Tubes and Hard Rubber Products; Wood, Iron and Steel Products; Engineering Appliances; Radiators and Boilers.

The largest of the factories had more than 15,000 on its payroll, while the smallest had a little over 300 on its payroll. Just as these factories vary as to the number on the payroll, so also do they vary as to employment conditions. In some, the conditions were bad, in others, very good conditions existed, in other words, an average picture has been obtained.

The figures shown, representing a few replies, are not given with the idea that they are exactly accurate but for the purpose of conveying an idea as to the approximate cost of labor turnover in the various industries.

From a compilation of the various estimates made by industrial and employment managers of various industries in the different parts of the country, I believe $50.00 would fairly represent the average replacement cost per man in American industry as a whole. In other words, as 32,985 persons were unnecessarily employed in these ten factories, an approximate loss of $1,649,-250.00 was thereby entailed.

This cost of hiring and firing does not appear in the overhead charges of business organizations as an item of expense. In many places, there is no knowledge of the cost, yet the estimated economic loss in the United States due to labor turnover is placed by some as around one billion and a half dollars annually.

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Where the Miner Makes a Change

Modern Facilities for the Worker in the Coal Fields

By M. E. Clements

WITH the idea that cleanliness is at least somewhere next in line to godliness, and with the further idea that the miner, rushing home in the gloaming to embrace his waiting spouse, should not necessarily have to leave a coal-black smudge on the lady's cheek, the larger mining companies of the United States are spending considerable sums of money in providing for their employees what are known as wash-and-change houses. In these buildings the man who toils underground to produce the nation's illimitable mineral wealth may cast aside his overalls, revel in a bracing shower bath that removes from his countenance its outer



Fig. 1. The miner, after working a few hours in this sort of thing, can appreciate a "wash and change."

coat of soft ore or coal dust, don the same street clothes affected by doctor, lawyer, merchant, chief, and jump into his tin flivver for the homeward spin to a good wife who need not dread the contaminating effects of her breadwinner's osculation.

Good health and strong morale among the employees of any industry are today recognized as important factors in the maintenance of a high standard of production, the Bureau of Mines, which has made a study of wash-and-change houses, points out. In the mining industry, sanitary change and wash houses increase the efficiency of the miners by enabling them to attend properly to their physical needs after strenuous exercise, often in damp or wet mines.

When the mining industry was yet in its infancy, the miners changed their clothes at home, leaving the mines after work—dirty, tired, and with clothes saturated with perspiration, a custom inconvenient and resulting in much ill-health. Many miners found it more satisfactory to change their clothes in the boiler rooms. As the industry grew, the mining companies realized that

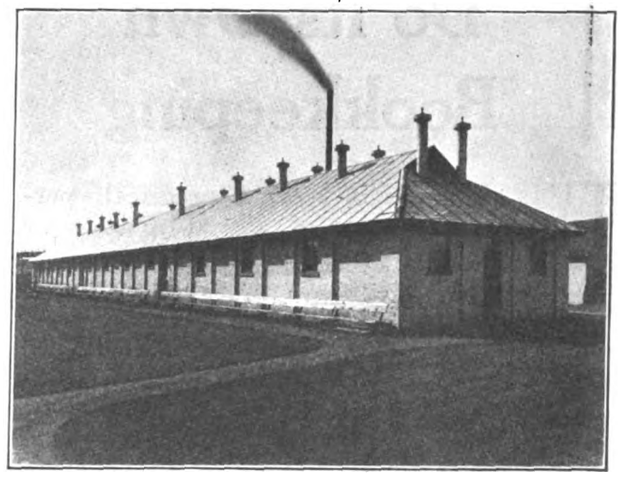


Fig. 2. Exterior view of wash-and-change house at a large metal mining operation in the Lake Superior region.

change houses must be provided. These were mere shacks at first, but the modern change house, developed from these unpretentious beginnings, is a model for sanitation, comfort, and efficiency.

The wash-and-change house should be placed near the manway exit of a mine, so that the men, upon coming out of the mine, will not be exposed unnecessarily long to the rain and cold. At some mining operations, tunnels connect the mine with the change house, so that the men are not exposed to the elements at all.

The great majority of the modern change houses have cement floors, a composition naturally adapted to wholesale bathing purposes. The walls of the building should be high, perhaps 16 or 18 feet, particularly if the clothes of the miners are suspended from the ceiling as is frequently done. The building should be maintained a little above the temperature of the mine, so that the miners will not become chilled when changing their clothes. In cases where the clothes are wet, the temperature of the building may be raised after the miners have departed so that the clothes will be thoroughly dried out when they are put on again.

A satisfactory method of drying the miners' working clothes was one of the worst difficulties encountered in the development of the wash-and-change house. In some

(*Continued on page* 102)

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How Applied Ingenuity Has Multiplied Production

(*Continued from page* 29)

sleeves, gears, we notice the second step in the development of the idea of automaticity—the turret. Let us consider the very simple case of a bushing, for example. The outside has to be turned, which would mean a roughing and a finishing cut, the inside to be bored and reamed to size; in the simplest case four different operations.

If the work were to be done on a regular engine lathe, the operator would have to set up four different tools in succession and perform the four operations. The original idea of the *turret* was to have all four tools mounted on it and have the turret revolve in such a way that each tool could be set in line with the revolving spindle and also back and forth on the bed of the lathe. The next step was to add an automatic revolving motion to the turret, which would take place when the carriage was moved away from the work and index the turret into the next position automatically.

A typical example of machines of this type is shown in Fig. 2. Both types, the simple and improved turret lathe, are very much in use now and a variety of designs embodying the same general principle is being built by leading manufacturers in this country and abroad. They all cover the same idea and the difference lies in the drives, controls, arrangements of turret and tools, the fundamental principle being:

The operator chucks the work, advances the carriages and engages the power feed. *All tools are set to dimensions.* The operator does not set the tools nor does he do any calipering (except to ascertain that the tools are cutting to size).

This analysis would not be complete without mentioning the application of the multiple tool idea on work set on centers and requiring just turning. In this case the tools are set on two carriage rests, which travel across the bed—of course in this case the construction is entirely different, the principle remaining the same.

The turret machine embodying the principle of many tools set in advance to cut to a predetermined dimension is really the biggest step in the development of the automatic tool—it started a new era in machine shop practice and made possible the next step, which is the full automatic chucking lathe and the automatic screw machine.

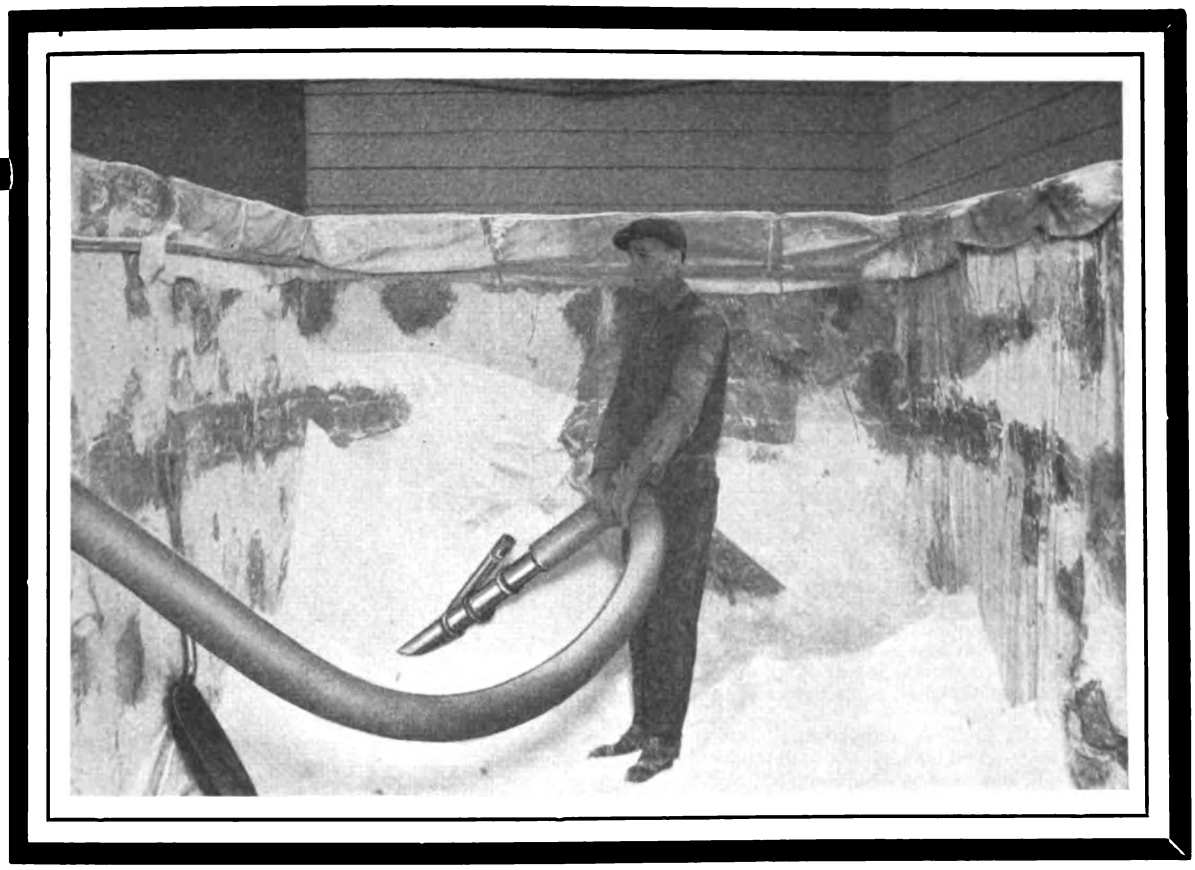
The automatic chucking lathe is nothing else but an improved turret lathe with an additional mechanism causing the turret to advance under power feed return and revolve to the next position. All the operator does is to chuck the work and start the machine—which will stop by itself as soon as the full cycle is completed.

The combination of the two ideas: (1) the turret holding many tools in advance; (2) the mechanism for feeding the turret and indexing it on the back travel—made possible the design of the automatic screw machine, which in its simplest form is an automatic turret machine with a head arranged to hold and advance a bar of rolled steel.

The field of the automatic screw machine is somewhat limited by the fact that as a rule it is being used on work made of rolled steel; nevertheless, even with this

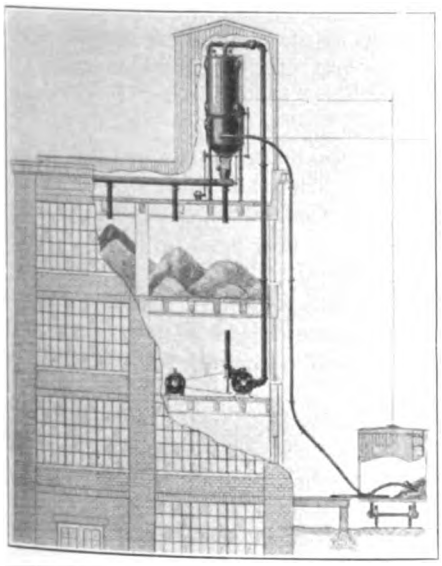
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(Continued from page 36)

limitation the field is enormous and it is safe to say that the automatic screw machine is responsible for the existence of the cash register, typewriter, the sewing machine, many kinds of household appliances, the low-priced motor car. In other words, it created what we call modern civilization.

We have to mention here the multi-spindle automatic and the station type machine even if this is a little aside of our main subject.

On the five spindle automatic screw machine shown in Fig. 7 five spindles revolve, each holding a bar of rolled stock; five tools each in line with one of the spindles advance and perform five different operations simultaneously—after this is completed, the spindle with the work revolve one-fifth of the full circle and the next operation is performed on each piece of work.

All this means:

1. Five different operations are being accomplished at the same time.
2. A full cycle of the machine completes five pieces.
3. If the work requires five operations to be completed, the time is equal to the duration of the longest operation.

The station type automatic chucking machine represents the same general principle although very different in construction.

A horizontal table which can be indexed in five different positions consecutively holds five chucks, all of them revolving with the work except the one being in the loading position in front of the machine.

The four different combination cutting tools which can perform a variety of operations, such as turning, boring, recessing, facing, are above the chucks and have a power feed down and a rapid return—all automatic.

The operator stands in front of the machine and does the unloading and loading. The machine does the rest.

This short description of the multiple spindle screw machine and the stage type chucking machine throws the principle, which is the same in both cases. It also shows that this principle does not mark any step forward in the way of eliminating the human factor and making the work more automatic. Both machines, however, are tools of unusual capacity and probably the biggest labor savers, due to the fact that they perform four operations where machines of different type perform only one—due to the same fact, the multiple spindle machines changed to a considerable extent conditions in the machine shop industry and no description of this subject would be complete without them.

We have been referring so far to lathes and their different modifications, first because, as stated above, fully 50% of machine work is being done on machine tools of this character; second, because the same principles have been applied on machine tools of different types like milling and gear cutting machines, threading and tapping machines, finally on drilling machines. The same general principles of multiple tooling, automatic power feed and reverse, more than one operation at one time, can be seen prevailing on all classes of tools—it must be stated, however, that the most advanced ideas are applied to the lathe due to the wide scope of its activity.

The analysis of automatic tools shows clearly one thing: the highest step of development so far is the

(Continued on page 40)

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McLaughlin's Key Question

THE Leviathan was twenty-four hours out of Southampton. Dawson ran his eye over the wireless news. One item caused him to start: "It is McLaughlin," he exclaimed, handing the printed sheet to his companion, a well-known consulting engineer.

"*The report was confirmed today that Edward McLaughlin, who is returning from Europe on the Leviathan, has resigned as President of the Amico Emulsion Company. Announcement of his future plans will be made on his arrival Thursday.*"

"If," said Dawson, with kindling eyes, "if we could only get him to head *our* Company, now that we've clinched the rights to the improved French process, we would surely turn the tables on his old concern and give them a taste of the competition that has driven us hard for ten years."

"Right! McLaughlin was the brains of your competition," replied the Consulting Engineer. "Why don't you get hold of him tonight? Lay everything before him. Offer him the presidency and *you* take the Chairmanship of the Board."

* * * * *

IN a sheltered corner of the main deck, after an hour's earnest discussion, McLaughlin gave Dawson his answer.

"With all due respect, Dawson, if you had ten French processes we couldn't work together. There's a basic difference in our business principles—a difference simple enough to explain but hard for men of your training to grasp. In that portfolio of plans for your new building I could find a dozen samples of what I call costly economy."

"You mean my plans and specifications are open to criticism?" gasped the Consulting Engineer.

"Perhaps so—perhaps not. But let me ask you one question—the key question I always ask myself. It is this—'Mack, would you buy this same thing if you had to make your living selling its performance against the performance of anything else on the market?'"

"Why, that bars you from ever buying anything on price," exclaimed Dawson.

"Most certainly it does," McLaughlin exploded. "But let's stop generalizing. Open that portfolio and 10-to-1 I'll show you from your blueprints how you plan to cheat your company and your stockholders!"

Dawson's eyes snapped. "Show him the heating system. Show him your engineering layout that saved us $4,000."

"No," demurred the Consulting Engineer, "you insisted on steam heat when I proposed to use hot water. Let's take power."

McLaughlin: "For a reason I'll tell you about in a minute, I would like to prove my point with Mr. Dawson's heating system. There you are," he exclaimed, stretching out the first blueprint. "Two stories, 140 x 400; no need to go any further. If you were selling heat to this plant instead of making your own heat, and were in competition with me and a hot water system, you wouldn't have a Chinaman's chance.

"I could give you better heat for $1,000 less per year and still make a bigger profit than you could with your low *first-cost* steam system. To save $4,000 on first cost you saddle your company with $1,000 extra expense a year forever."

"Why, that's plain as a pikestaff," laughed Dawson, turning to his Consulting Engineer. "Why didn't you illustrate it to me by a 'buying-heat,' 'selling-heat example' instead of all that stuff about 'heat losses,' 'flexibility,' 'frictional resistances' and 'B. T. U's'?"

Consulting Engineer: "Because I'm not McLaughlin. That faculty of making other people see what he sees is what makes McLaughlin McLaughlin."

McLaughlin: "That's a mighty fine compliment, but I'd never have succeeded so easily if I had taken as my example power, machines or building construction, although the point is true just the same."

President (ruminating): "Always buy a thing as if you were going to sell its performance—it's a new idea."

McLaughlin: "To a great many men, yes, and that's why I am launching a company to sell heat on the largest scale ever undertaken in America. Even in Wall Street they were interested. I showed them how the Heat Utilization Committee of the National District Heating Association reported at the last meeting in Atlantic City that by actual comparison hot water heating saves 20 to 50% in fuel as against steam."

Consulting Engineer: "It does if you get the right system put in right."

McLaughlin: "I've got that licked. I've found one firm that sells as I buy—on performance. That's Grinnell Company."

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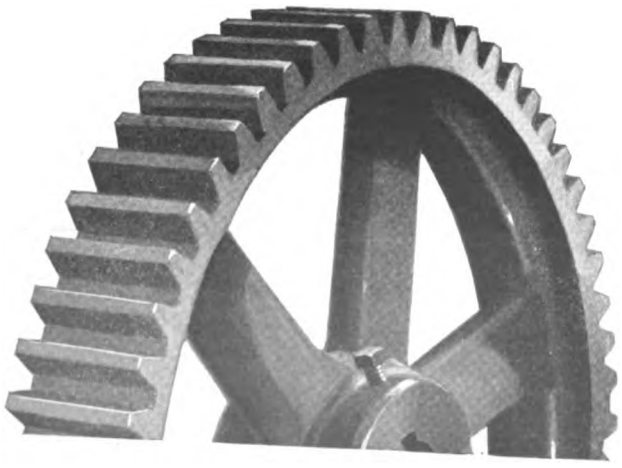
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(*Continued from page* 38)

machine where the operator does the loading and the machine does the rest; the question arises how can we eliminate or at least reduce that loading to a minimum.

It stands to reason that the human factor cannot be entirely eliminated. Therefore, what remains is purely and simply a labor saving problem. Numerous attempts, some of them very successful, have been made in this direction—the automatic screw machine for car stock is the first example—on this machine the stock used to come in bars of considerable length, and on certain classes of work a bar keeps the machine going for several hours. On certain pieces, a second operation has to be performed—like threading the other end of a stud—on this class of work a magazine containing a large number of pieces is fastened on the back end of the spindle and it feeds the machine. This last idea of the work magazine, hopper or chute and its further development—the conveyor, which brings the work direct to the holding or chucking device, is the last step in reducing the operator's activity to a minimum.

The magazine idea, while very popular on such work as made of rolled stock, and therefore fairly uniform, has one great handicap: on castings or forgings which vary slightly—and every shop has great quantities of this kind of work, the magazine or hopper cannot be successfully applied. On the other hand, the hoppers feed in the machine shop is a recent development, and it may be that further experimenting along these lines may bring out very radical improvements and changes. There are several methods of automatic adjustments and some of them look thoroughly practical, and chances are that further experimenting may bring to the point where any kind of pieces, within certain limits as to size and weights, provided the quantity is sufficient to make any such installation economical, will be simply loaded into a large hopper and automatic carrying devices will bring them directly into the machine which will perform all the work required.

WE once met a man who had never studied the business cycle from the statistical standpoint but who always appropriated money for mail-order advertising with the stipulation that the mail-order letters should be sent out when the stock market showed signs of entering a bullish period. This policy, of course, is not at all bad for those who follow the business cycle. But as stated above, this man knew nothing about the business cycle. He had merely observed that many of his friends were optimistic and spent money freely during a bull movement in the stock market, and his idea was that he would get a larger response to his mail-order campaign while the stock market was rising than he would during a period of stock market reaction.

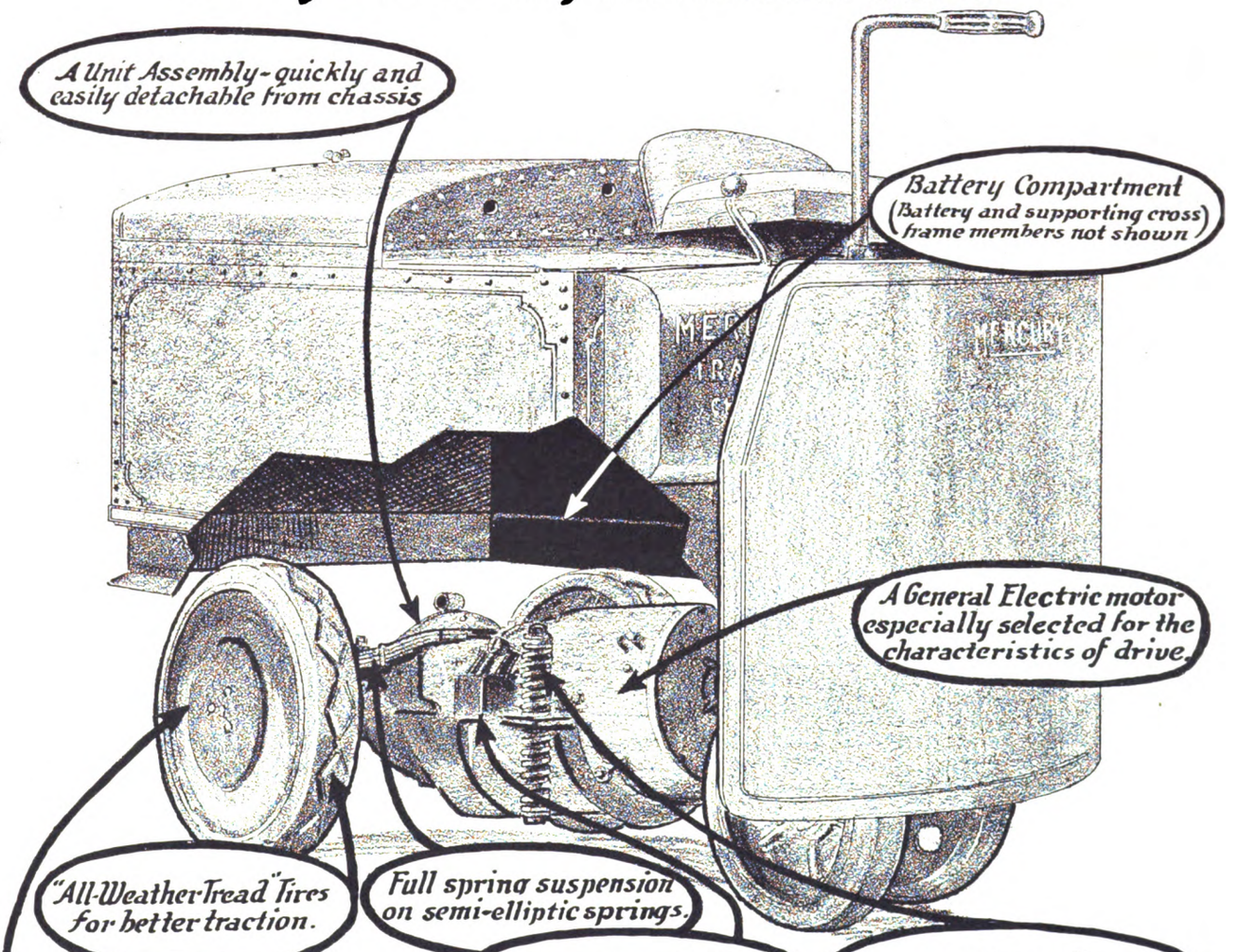
When the stock market rose rapidly after the election many business men expanded operations too rapidly. Now that the stock market has declined somewhat drastically, they are becoming skeptical of the business outlook.

We expect temporary irregularities in prices and occasionally some curtailment in production, but we continue optimistic regarding the total volume of trade for the year 1925 as a whole.—*Alexander Hamilton Institute.*

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The Drive Unit - The outstanding Feature of The Mercury "Type-H" Tractor

Its points of superiority will appeal to anyone using industrial tractors



The above points are elaborated upon and many others fully explained in Bulletin #106. A copy will be mailed upon request.

Mercury

Manufacturing Company

4112 - So. Halsted St. Chicago

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For Complete

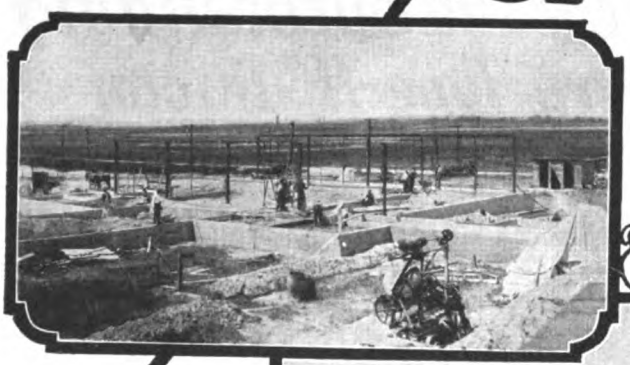
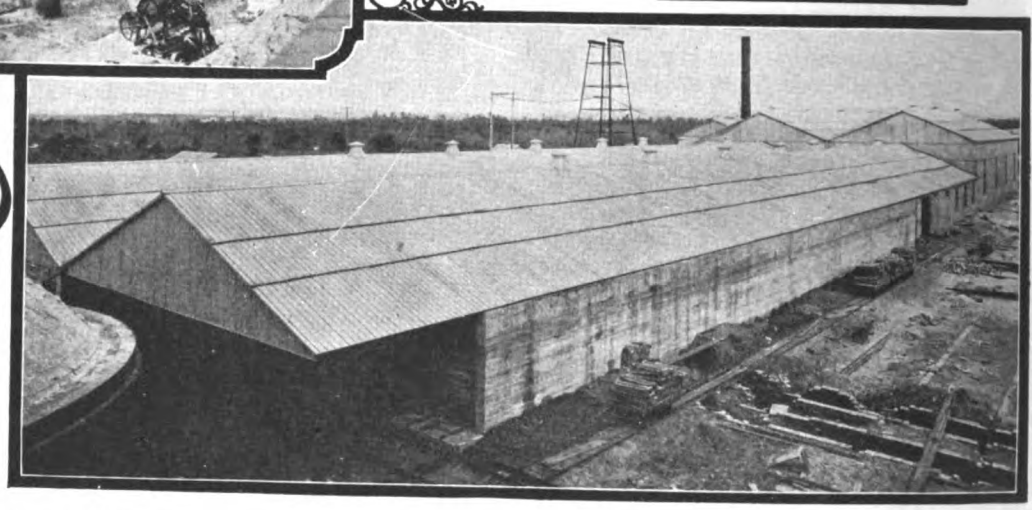


Illustration at left shows concrete foundations completed and erection of frame work begun. Note the few workmen in evidence.

Illustration below shows a group of buildings which form part of the complete Blaw-Knox installation of the Atlantic Brick Manufacturing Company, Mays Landing, N. J.

IF IT'S A ONE-STORY BUILDING PUT IT UP TO BLAW-KNOX





Time tells the story

Blaw-Knox is the time-tested, rust-protected steel building whose endurance through years of hard service is proved by countless numbers of installations dating back through two generations of users. The achievements of these years are marked by many exclusive and fully protected features which set Blaw-Knox apart as the most highly perfected, durable and economical steel buildings made.

Only Time can tell the story of the value of your building investment. Time favors Blaw-Knox. You owe it to yourself to investigate the remarkable records of this steel building. Fill in coupon and mail today.

BLAW-KNOX

ARE YOU in a business which may require you to have plants or groups of buildings in different sections of the country in order to produce and deliver a commodity to your market quickly and economically? This necessity is not an unusual one. In the next few years the problem of minimizing the cost of distribution will find many manufacturers producing in various market centers rather than in one location.

Or if you must expand your factory, change your location or rebuild, how should you plan these operations? Is it likely that you would erect concrete buildings at one place, brick in another, wood in a third? Would you multiply the cost of specifications, time and labor—increase the overhead—add to the hazards and uncertainties involved in so many different types of construction? Would you complicate your records with widely varying costs, rates of interest, insurance and depreciation? *Or would you standardize?*

Would not you standardize on that type of construction which satisfies the housing requirements of your business—one which could be contracted for and erected with the least amount of trouble, the minimum of labor and time, the lowest cost, the lowest upkeep, the longest life?

The Standardized Building

That brings us to the Blaw-Knox all purpose, one-story steel buildings and wherein they offer industry—the manufacturer of the present and future—so many advantages.

1 The Blaw-Knox one-story building is designed and standardized in just those types and sizes which long experience has shown meet all the requirements of industry. These types and sizes are made up from stock sections to meet your exact specifications. You can appreciate how quickly we can fill your order and make one complete shipment. There are no wastes of material and labor, no delays in building.

2 No time is lost because of cold weather if you are building in the winter. The New York Committee on Seasonal Operation in the Construction Industries has issued a report stating that, out of 125 working days from Nov. 1 to Mar. 31, an average of 67½ days, over a period of ten years, showed freezing temperatures or pre-

Blaw-Knox Company,
Pittsburgh, Pa.

Without obligation, send me your literature. We have in mind a building

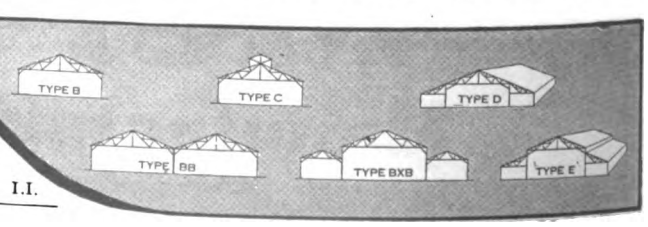
_____ft. long _____ft. wide,

to be used for_____

_____Type_____

Name_____

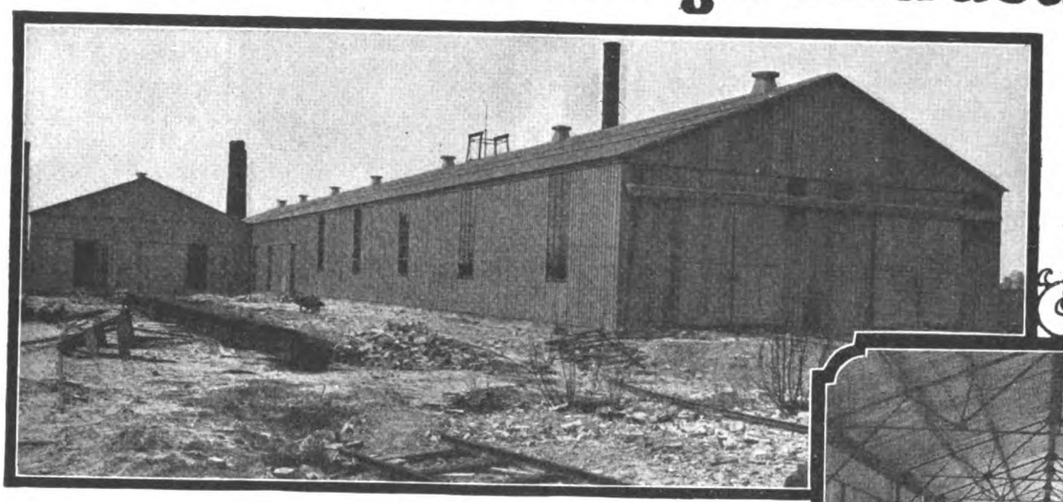
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Plant Design

Blaw-Knox Time-Tested, All-Purpose Buildings meet every requirement of present and future industrial one-story building construction



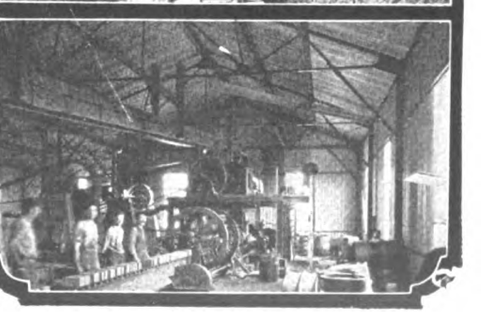
At left, another group of Blaw-Knox buildings at Mays Landing.

Interiors below show uses of Blaw-Knox buildings in the brick industry. Many other industries are being similarly served by Blaw-Knox buildings which have universal application for one story construction.









cipitation between 7 A.M. and 6 P.M. which made building construction difficult. This almost prohibits masonry construction—***but it does not interfere with steel.***

3 The Blaw-Knox one-story building is economical in use and cost of material. The frame, columns and supports are not under heavy stress; the side walls carry no weight; and the foundation need be only as strong as the floor requirement. Yet the design provides unusual strength and rigidity.

4 The interlocking unit construction permits of quick erection even with unskilled workmen. Local labor can assemble and erect from our plans with supervision of one of our erection superintendents.

5 The Blaw-Knox one-story steel building represents complete flexibility. It can be enlarged, changed in shape, windows and doors re-arranged, or the building can be entirely dismantled and re-erected in a different location, without loss of parts and with no trouble, and little expense.

No immovable masonry to keep you shackled to an expensive location under heavy operating costs!

6 The Blaw-Knox steel building is weathertight, leakproof and fire-safe. Galvanized, rust-protected metal insures long life. Blaw-Knox Time Records give convincing evidence of enduring service. ***Blaw-Knox is the pioneer of all-steel construction. Fifty years of tested experience back our claims of highest quality.***

7 You can call Blaw-Knox Engineering Service by wire, telephone or letter. District offices are located in principal cities for your convenience. We take over your entire proposition, and erect your building if you desire. You have only one contract to sign, and you can know in advance the final cost and time your building will be ready for occupancy.

Do not award contracts without investigating Blaw-Knox construction and service. Send for catalog as the first step or, if your requirement is urgent, telephone or wire our nearest district office. It involves no obligation.

BLAW-KNOX COMPANY, PITTSBURGH, PA.
680 FARMERS BANK BUILDING

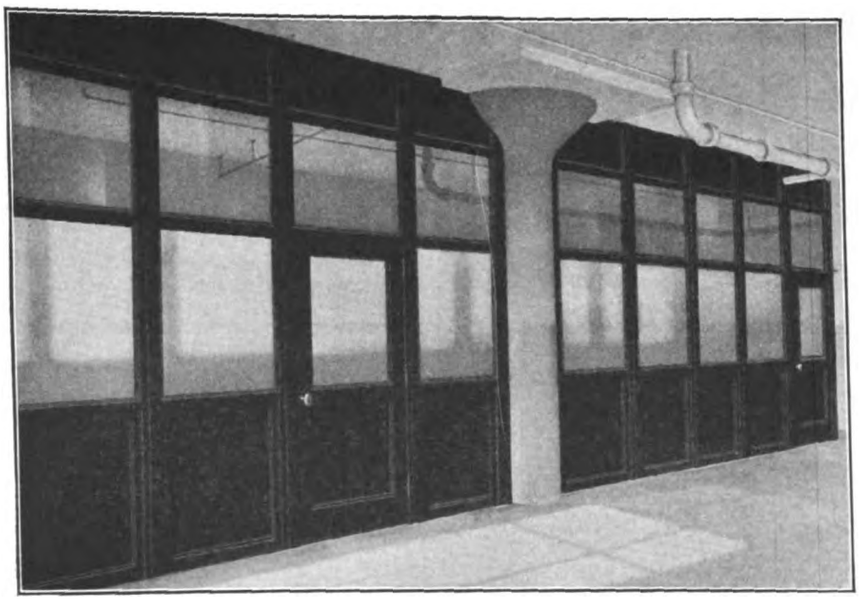
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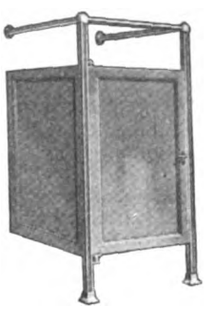


Installation for Shering & Glatz, Newark, N. J.

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SANYMETAL Partitions for Offices and Toilets are a sanitary, rugged, economical metal construction that fits modern industrial conditions. Standard unit sections keep down the cost and facilitate erection.

Flexibility for changing needs is a distinct advantage—partitions can readily be taken down and re-assembled. Fire hazard is reduced. Permanence in construction and finish means low upkeep. Many industrial concerns are replacing antiquated wood partitions with these practical units. Our engineers will make suggested layout for you.



Sanymetal Products are: Partitions for toilets, showers, dressing rooms, urinals. Partitions for offices and factories. Metal doors, screens and wainscot. Sanymetal Gravity Roller Hinges for toilet doors. Write for latest Bulletins.

The Sanymetal Products Co., 1709 Urbana Rd., Cleveland, O.

Sanymetal

TRADE MARK U.S. REG.

Toilet and Office Partitions

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Does Utility Forbid Beauty?

(*Continued from page 32*)

credit for giving Detroit manufacturing plants and public buildings that combine the beautiful and the practical to an exceptional degree. That man is Albert Kahn.

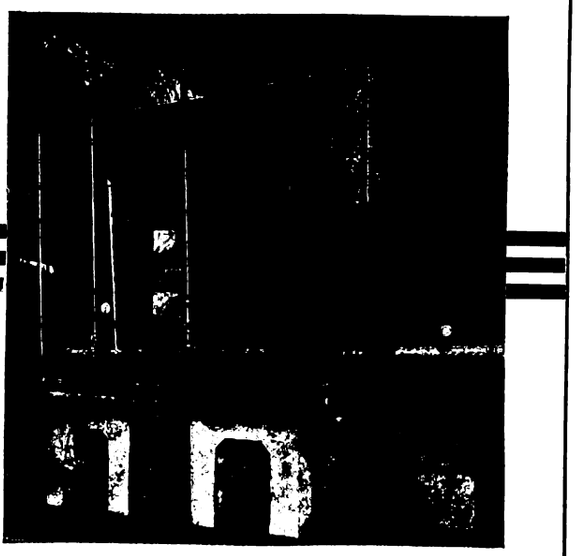
Albert Kahn was a pioneer in designing manufacturing plants that would be handsome as well as efficient. He entered business in Detroit just at the time when the automobile industry was gathering momentum for the amazing advance it has made in the past twenty years, and he grew with Detroit and with the automobile industry. He is the architect who designed every one of the plants and buildings named above, besides scores of others, both in Detroit and other cities, that are almost equally as prominent. He is the architect who executes the architectural plans of the Ford Motor Company, having drawn the plans for the original Highland Park plant and for the majority of Ford plants and buildings that have since been erected, including the glass factory, cement plant, steel mill, motor products plant, and addition to the foundry at River Rouge, the Walkerville, Canada plant, and assembly plants in Memphis, Dallas, Charlotte, Norfolk, Louisville, Salt Lake City, Jacksonville, and other cities, and that "glorified workshop," the Ford Engineering Laboratory at Dearborn, Michigan. He is one industrial architect who has been made a fellow of the American Institute of Architects, the highest honor that can be conferred on one in his profession in this country.

It is hardly necessary to describe the dingy, dirty, poorly-lighted, poorly-ventilated, poorly laid out factory that was typical of American manufacturing plants twenty-five years ago. A factory, it was then thought, was only a place to work and it was ridiculous to think of undertaking to beautify such a building. Four rough brick walls, pierced at infrequent intervals by small windows the glass of which was so deeply coated with grease, smoke, and dirt as to make it almost opaque, and a solid flat roof without a square foot of glass were the requirements for a factory building. As the business grew and additional space was demanded, other buildings were erected wherever and however most convenient, with little or no regard to harmony or coördination.

Albert Kahn thought all this was wrong. He could not believe that a building must necessarily be ugly just because it was to be used as a factory. On the contrary, he was convinced that, other things being equal, a handsome factory would be a better factory and the workmen in a handsome factory would be better workmen.

Mr. Kahn also believed in the future of concrete and long before this now popular material came into general use, he was experimenting with it and using it to a limited extent wherever he could do so.

"Henry P. Joy, former president of the Packard Motor Car Company, was my patron saint," he declares in speaking of his early experiences. "I had done some work on his residence which he liked and when he brought the Packard plant to Detroit, he gave me the job of designing the buildings and permitted me to use some concrete. He readily agreed with me that the buildings should be handsome as well as practical and allowed me to carry out my ideas with little or no interference. That gave me a start. Other industrialists admired the Packard plant and saw the advantages of



A CARRIER COOLER IN AN INDUSTRIAL PLANT

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Built in two types, Open and Closed, these coolers have many exclusive features of construction and operation, developed and tested over a long period of years. They supply clean cool air with unfailing regularity, **at a cost so low that it is negligible when considering the benefits obtained.**

Space here is inadequate to even sketch the information you should have about these machines. A new catalog has just been issued; a request on your business letterhead will bring a copy.

If you operate generators it will pay you to know more about

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EVEN A BARBER POLE MAY BE MOTOR DRIVEN

PERHAPS you, like the inventor and manufacturer of the animated barber pole, are developing a motor driven novelty, tool or appliance. It may be, too, that a perplexing power problem is handicapping its success. If so, we invite you to utilize the services of our Engineering Department.

This department, for many years closely in contact with the uses of small motors, is accustomed to adapting fractional horsepower motors to "new fangled" applications. And to those manufacturers, who anticipate a change in the power unit they are now using, the advice of these motor experts will be especially valuable. Write them any time.

Dumore motors—dynamically balanced, operate quietly, without vibration. Bearing trouble is thus eliminated—long, carefree service assured. Operating on alternating or direct current, Dumore high speed motors are exceptionally adaptable. These special features qualify Dumore motors as the logical choice of manufacturers who require high speed power units for the products they make. Scores of manufacturers of motor driven tools, novelties and appliances, have found in Dumore motors a satisfactory solution of their power problems. Why not investigate and learn what these sturdy motors can do for you?

WISCONSIN ELECTRIC COMPANY
7000 Sixteenth Street Racine, Wisconsin



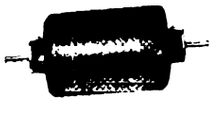
Type-SAX
⅛ h.p. motor with special base. Nickel plated. Operates on A. C. or D. C.



Type-A—Stripped
⅛ h.p. Cast iron frame, enamel finish, Babbitt bearings, wick oil feed operates on A C. or D C.



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¼ h. p. Cast iron frame. Enamel finish. Plain bearings. Grease cups. Operates on A.C. or D.C.



No. 3GM—Stripped
¼ h. p. Aluminum frame. Enamel finish. Norma Bearings. Ventilated. Operates on A. C. or D. C.

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such buildings and when some of them undertook new plants, they gave me the job of designing them. The automobile industry was just developing and as it grew, I grew along with it. I have since designed the plants of nearly all the leading automobile companies in Detroit and some in other cities.

"It so happened, too, that the Kahn system of reinforcements for concrete work was perfected about the same time, and this aided us materially. My brother, Julius Kahn, who had graduated in engineering at the University of Michigan and had been abroad, joined me about 1905 and immediately showed me some of my mistakes in the use of concrete. He made a special study of reinforcements and originated the Kahn system, which revolutionized the use of reinforced concrete and later resulted in the formation of the Truscon Steel Company, of which he is still president. When his design was first published, Captain Sewell of the Bureau of Standards at Washington, who had made tests of concrete structures, invited him to Washington and gave him a Government contract for some concrete work. This established us in the field of reinforced concrete.

"Another notable step in the development of handsome factory buildings was taken when Mr. George Booth, of the Detroit News, agreed to permit us to use stone on the outside of the new plant for his paper. The use of stone in office buildings was nothing unusual, of course, but the News plant was not an office building; it was to be a factory, pure and simple. Mr. Booth is a man of artistic taste, however, and he wanted his new plant to be a handsome one as well as the most modernly equipped plant of the kind in the country. As a result, the Detroit News Building is without doubt the handsomest building of the kind, devoted exclusively to manufacturing, in the country. Some of the New York papers have handsome office buildings, but they are not exclusively devoted to manufacturing purposes; they are printing establishments housed in office buildings.

"During the World War, we were assigned the task of designing all the buildings of the aviation fields throughout the country and in several instances laid out complete towns.

"In addition to the factories and public buildings we have built here, we have had a number of large jobs in other cities. Among these are the Lima Locomotive Works at Lima, Ohio; the Pierce Arrow Motor Company at Buffalo; the Flint Motor Company at Flint, Michigan; and the Mishewaka Woolen Mills at Mishewaka, Indiana. Just at present we are building a club house in Chicago and an office building in Jackson, Michigan. We don't seek work in other cities, but we are now operating in about twenty different cities. The majority of these, however, are Ford plants."

In speaking of his work for the Ford Motor Company, Mr. Kahn is emphatic in his assertion that he claims no credit for what he has accomplished for the company. The Ford organization tells him just what to do, he says. and he merely carries out the orders received.

"The Ford Motor Company is different from any other concern in the world," he points out, "not in just one way, but in every way. It is a marvelous organization. The Ford executives always know just what they want—what they want is always different from what anyone else would want for the same purpose—and

(*Continued on page* 48)

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Serving a Double Purpose

This P & H Corduroy Crane erected steel at the new plant of the Mississippi Glass Co. at St. Louis.

It was purchased for the purpose of handling the cutting sand used in polishing the glass and for cleaning the sediment from the settling basins.

Because of its convertibility it erected the steel as shown in the illustration and thus retired a portion of its cost before a wheel started to turn in the new plant.

A great many industrial companies knowing the high quality of P & H Overhead Cranes have purchased the Corduroy Cranes also. Among these may be mentioned—American Brass Co., American Manganese Steel Co., Ford Motor Co., Sullivan Machinery Co., and many others.

If you have a handling problem of any kind let P & H engineers solve it. Our forty years' experience has qualified us for the job.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
Established in 1884
3850 National Avenue, Milwaukee, Wis.

New York, Philadelphia, Dallas, Jacksonville, Birmingham, Pittsburgh, San Francisco, Kansas City, Detroit, Minneapolis, Chicago, Portland, Memphis, Los Angeles, Seattle

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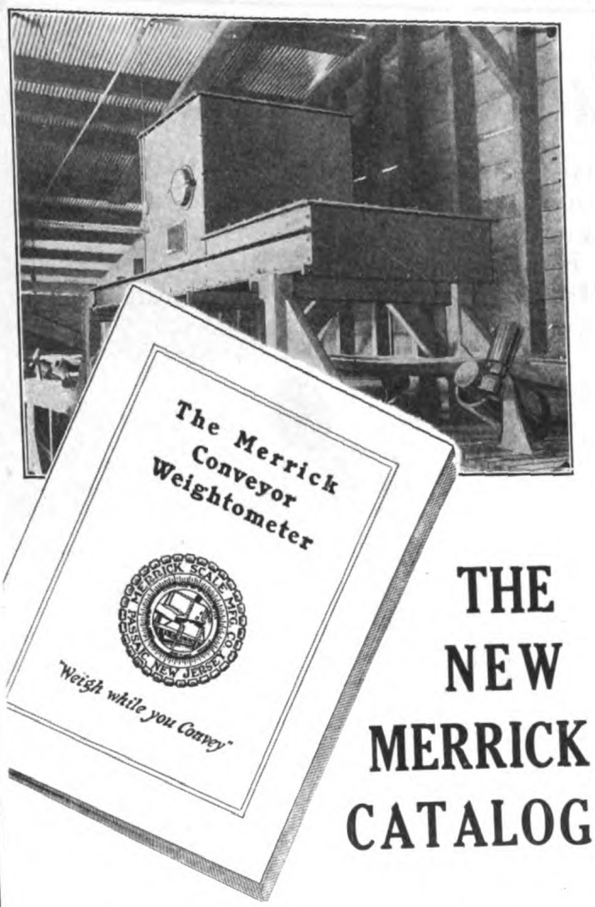
The versatility of the P & H is an important feature—it may be used with grab bucket or excavating bucket,—with electro lifting magnet, chain slings, pile-driving rig—as well as being readily converted into a powerful gasoline or electric shovel.



P & H CORDUROY CRANES

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Just off the Press!

If conveyors handle your coal, sand, coke, stone, gravel, rock, pebbles, wood chips, or any other bulk materials, this new Merrick Catalog will give you some valuable suggestions. It will prove to you that it is possible to keep an accurate check on every pound of material shipped or received.

Merrick Weightometers have been used for years by leading industrials. For these they have eliminated the reliance on bill-of-lading weights.

Merrick Weightometers are 99% accurate.

Write for your copy of the new catalog.

Merrick Scale Mfg. Co.

180 Autumn Street Passaic, N. J.

(*Continued from page* 46)

somehow their plans always work out. They absolutely taboo precedent and undertake to find a better way to do every job than it has ever been done before.

"When we got the order for the glass plant at River Rouge, for example, we didn't know a thing about building a glass factory. We didn't even know what was to go in the building. But we had our orders to design a building of certain specifications and we went ahead with it and it came out all right. The same applies to the steel mill which we are building for them now. We don't pretend to know anything about building steel mills, but we can follow instructions; and that is all we have to do on Ford jobs.

"The Engineering Laboratory at Dearborn is a remarkable building in many respects. We were the architects, but we don't claim any credit whatever for it. The whole thing, right down to many unusual little details, was Mr. Ford's own idea. He told us what he wanted and how he wanted it and we gave it to him.

"It is really a privilege to work for the Ford Motor Company. Ordinarily, we wouldn't care to serve as draftsmen for a client, but in this case we are glad to do it. We learn so much from Ford's that we are well content to follow their instructions, instead of undertaking to tell them what to do, as is commonly the case with other clients who don't have such definite ideas as to what they want."

Like many others in this country who have become prominent in their respective professions, Albert Kahn started at the very bottom and worked his way up against formidable obstacles. Born in a small town in Germany, March 21, 1869, one of eight children of only moderately well-to-do parents, he attended school till he was eleven, when his parents came to Detroit, bringing him with them, and he has never been to school since.

At the age of twelve, he secured a job as office boy with the firm of Mason and Rice, architects, working without pay for the privilege of learning the profession. At the same time, he waited on table at night to help earn his support, as his father had not been successful in business here.

In 1890-91 he traveled abroad for a year on a scholarship which he had won in a competition promoted by The American Architect, a magazine. This gave him an opportunity to study European methods, particularly the use of concrete in France.

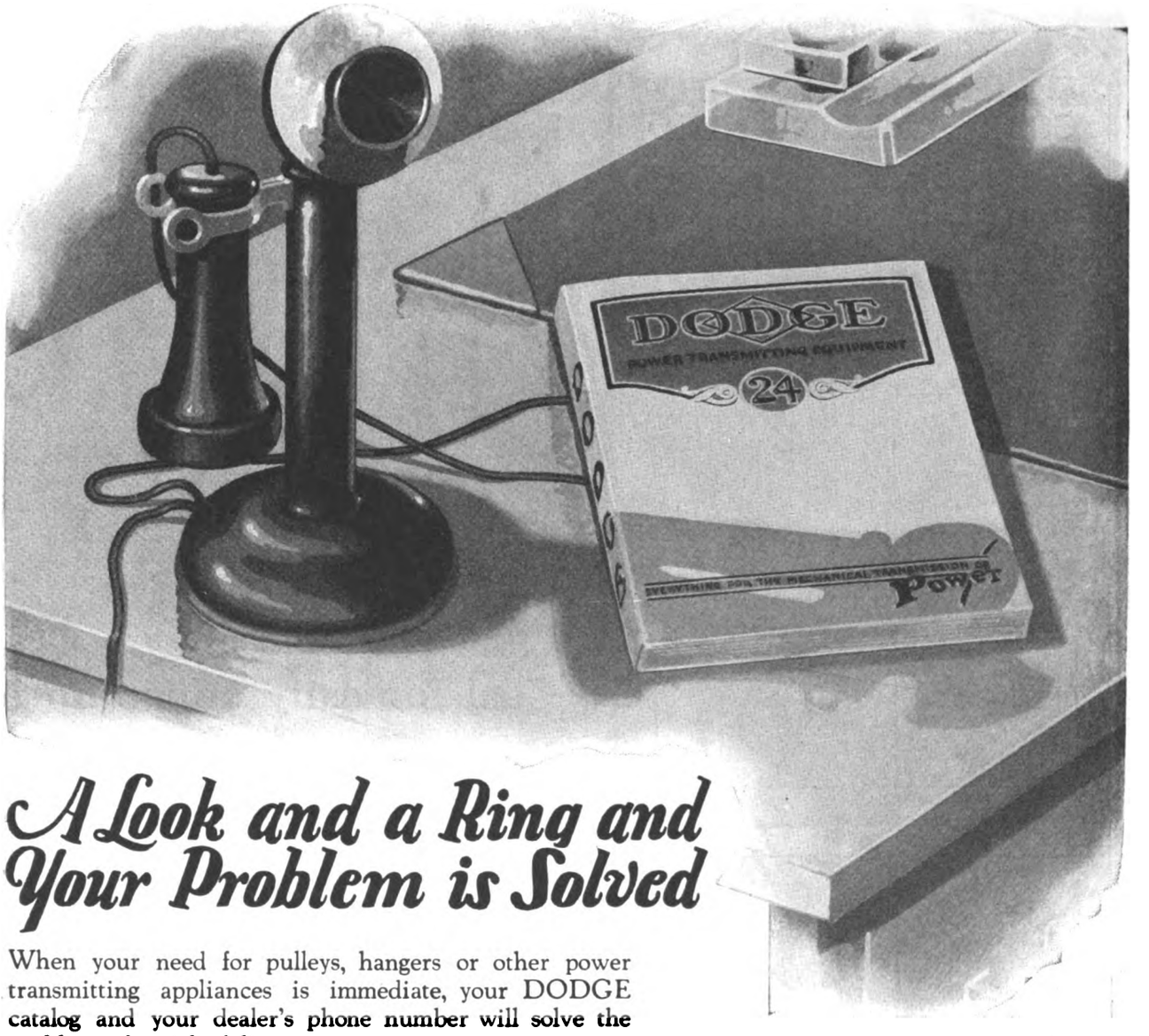
It was at this time, too, that he met Henry Bacon, designer of the Washington Monument. Mr. Bacon took an interest in him and invited him to spend three months with him. This was an invitation which Mr. Kahn considered a wonderful opportunity and one of which he made full use.

After spending thirteeen years with Mason and Rice, Mr. Kahn resigned to form a partnership with George W. Nettleton and Alex Trowbridge as Nettleton, Kahn and Trowbridge. A year or two later, Mr. Trowbridge became a professor at Cornell and soon after this Mr. Nettleton died, leaving Mr. Kahn as the only member of the original firm.

"Our first year's work netted us about $650," Mr. Kahn declares, "which had to be split among the three of us. Our first job, I remember, was a $6,000 house. The biggest job we got during our early years, and one that we thought was a mighty fine one for us to land.

(*Continued on page* 52)

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In the DODGE catalog you will find every appliance for the mechanical transmission of power—in your local dealer's stocks will be found the standard sizes to fill all usual requirements.

Back of the dealer stock are the fourteen factory branch warehouses and the two big plants at Mishawaka and Oneida. Through your dealer the entire facilities of this extensive engineering, manufacturing, and service organization are placed at your entire disposal for practical help in solving any problem that might develop in your plant and the supplying of standard, as well as special equipment from pounds to many tons.

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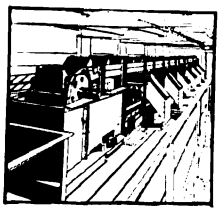
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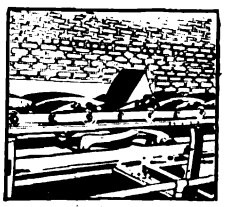
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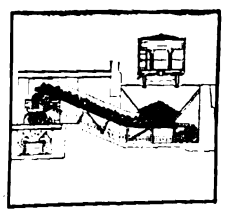
EQUIPMENT FOR EVERY COAL HANDLING NEED



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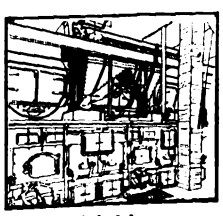
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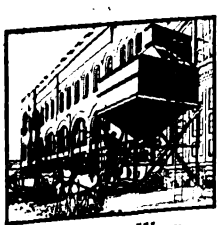
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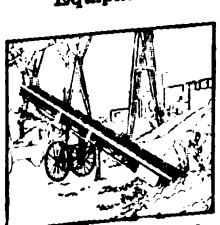
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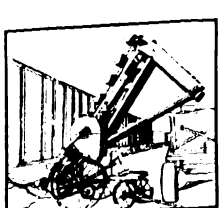
Ash Handling Equipment



Electric Capstan Car Pullers

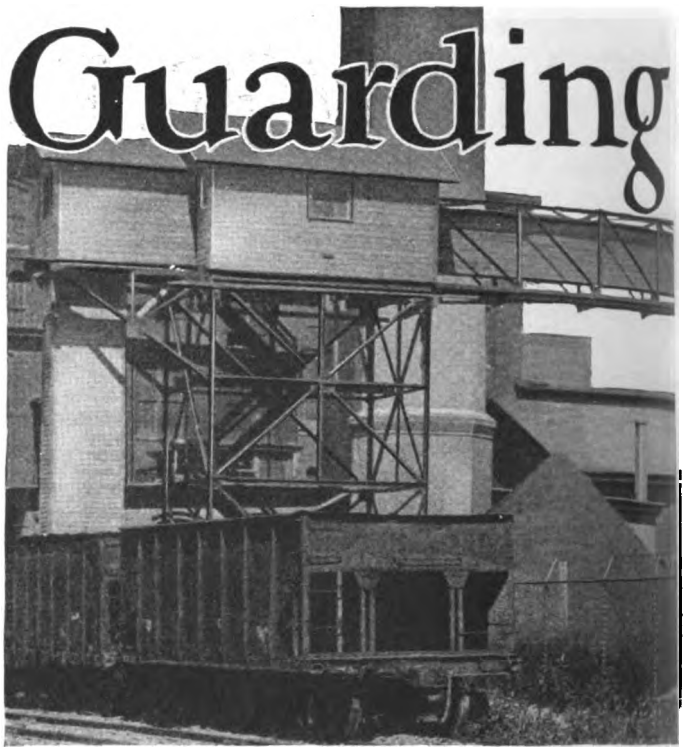


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Coal for daily consumption. A reserve for protection.

How Gifford-Wood solved the handling and storage problem

A more economical system for handling and storing coal was required by this large eastern manufacturing plant.

The equipment shown above, designed and built by the Gifford-Wood Co., solved the problem.

A time and labor saving system

(a) Provides facilities for economically handling and storing 10,000 tons of coal for both daily consumption and reserve.

(b) Handling capacity—50 tons per hour.

(c) Labor to operate—two men only.

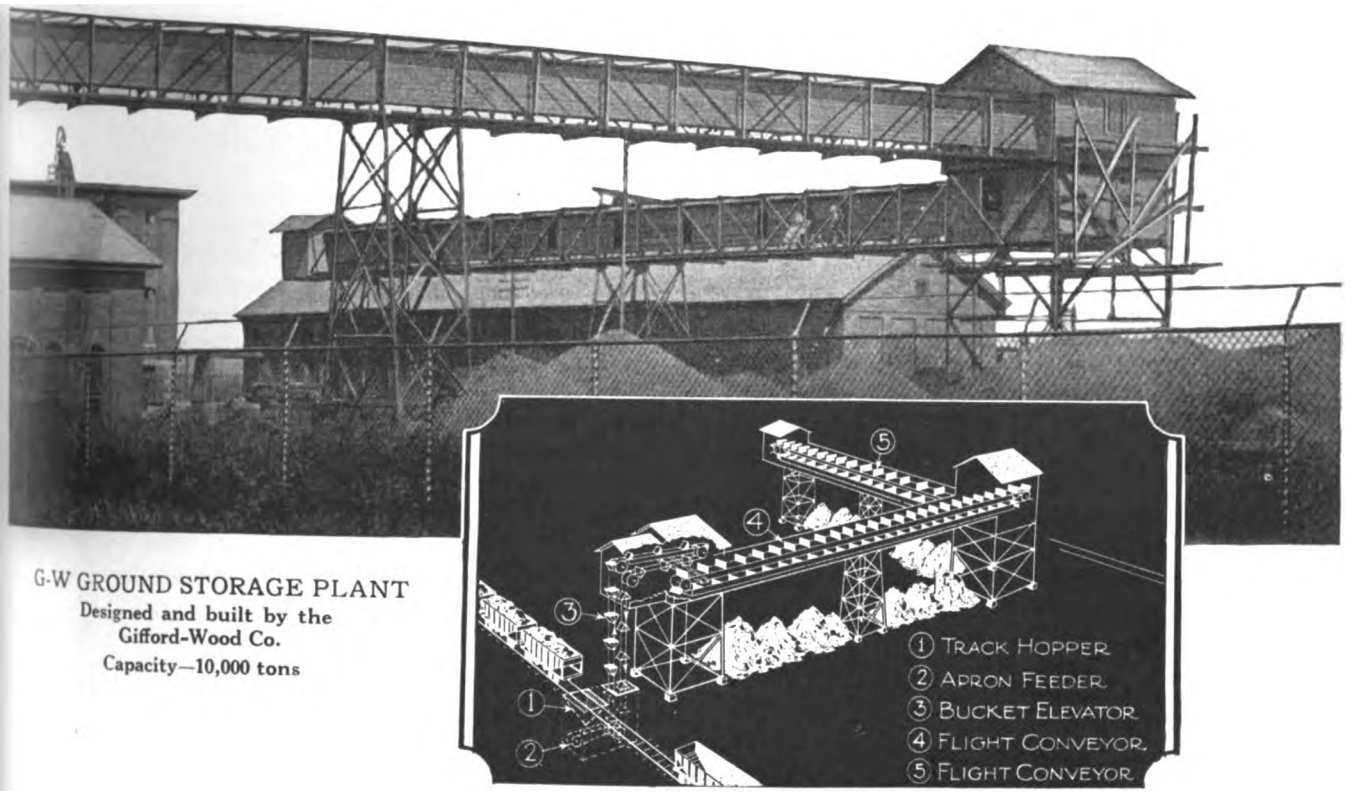
Gifford

ECONOMICAL COAL HANDLING

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Against the Rainy Day



G-W GROUND STORAGE PLANT
Designed and built by the
Gifford-Wood Co.
Capacity—10,000 tons

(d) Automatically picks up incoming coal from a track hopper, and automatically elevates, conveys and discharges it to storage piles on the ground.

Reserve storage protects against rising prices and shortages

(a) Coal may be purchased and stored when prices are most favorable.

(b) No possibility of costly shut-down losses due to strikes at the mines or transportation delays.

The Gifford-Wood Co. has had years of experience in designing and building coal handling equipment to meet diversified needs. It is prepared to design and build complete equipment for a plant of any size or type, to design and build equipment for extending existing coal handling facilities, or to furnish single pieces of auxiliary equipment such as gates and spouts.

Competent engineers, with many years of practical coal handling experience, are located at each of the offices below. They would welcome an opportunity to demonstrate the meaning of G-W Coal Handling Economy and to confer with plant executives and consulting engineers on any coal handling problem.

GIFFORD-WOOD CO.
Main Office: 16 Hill St., Hudson, N. Y.
New York: 50 Church St. Chicago: 565 W. Washington St.
Boston: 222 State St. Pittsburgh: Peoples Bank Bldg.
Plants: Hudson, N. Y., and Oakmont, Pa.

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Wood EQUIPMENT *for* ALL PURPOSES

BUILT STRONGER LASTS LONGER

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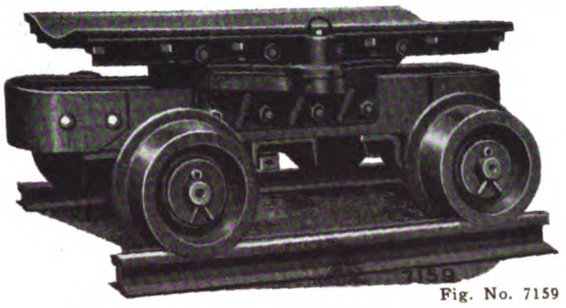


Fig. No. 7159

EASTON CARS

Where Minutes are Vital

The heavy rolls of paper that feed the waiting presses of the New York Tribune, Philadelphia Ledger, Inquirer and Bulletin, Detroit Free Press and other newspapers, are handled on EASTON CARS and Track. Thus modern requirements, where minutes are vital, are met with EASTON Equipment.

The new 1925 EASTON Catalogue shows cars and railway equipment for every industrial purpose.

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EASTON CARS
FOR EVERY INDUSTRIAL PURPOSE

A Marvel Portable Blower will increase your Machine Efficiency and Reduce Repair Costs



Try one for 10 Days Free



This compact and efficient portable tool will become an indespensable aid in keeping your motors, generators, switchboards and machines free from dust and dirt.

This Portable Blower is also suitable for use on blow pipes, soldering outfits, and small gas and oil furnaces.

Built compactly — light weight — only 6½ lbs. — handy to use — popularly priced—only $40.00. It has an air cooled universal AC or DC 110 volt or 220 volt ball bearing motor perfectly balanced. 20 feet excellent cable and armored plug. Toggle switch in handle, operated by thumb. Metal conduit carrying wires motor to handle. Absolutely guaranteed to give entire satisfaction. Let us send you a Marvel Portable Blower on 10 days' free trial.

Electric Blower Co. 352 Atlantic Ave.
Boston 9, Mass., U. S. A.

"MARVEL" PORTABLE BLOWER

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(*Continued from page* 48)

was the nurses' home at Grace Hospital, a $25,000 building."

The Albert Kahn organization now consists of about 250 people, including architects, structural and mechanical engineers, and about forty outside superintendents. It now does a volume of construction work totalling $30,000,000 to $50,000,000 a year.

"There are just two things I would like to emphasize in speaking to readers of INDUSTRY ILLUSTRATED," Mr. Kahn said in closing the interview: "Employ the best architect you can get and make your buildings handsome as well as practical.

"In advising industrialists to employ architects, it may sound like I have an axe to grind, but fortunately I have all the work I can do, so I can disclaim any selfish motive. It is a mistake for one to think that because he knows his particular line of manufacturing, he knows just how to plan a proper manufacturing plant. Even the Ford Motor Company, with all its wonderful organization and its specific knowledge of just exactly what it wants, realizes that it is to its interest to employ an architect to carry out its specifications. An architect will save his fee many times over by planning the work properly before it is ever begun, by looking after the multitudes of details, by protecting his client against unscrupulous agents and salesmen, and in literally hundreds of ways. Architecture these days is about 95 per cent. business and five per cent. art.

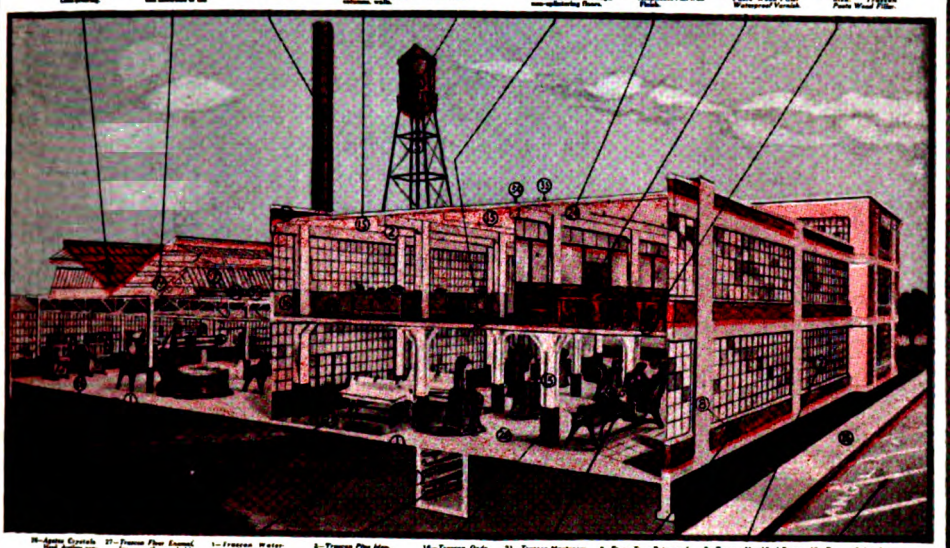
"It costs little if any more to construct a handsome building and there can be no doubt that any extra cost entailed will soon be repaid by the better work, less spoilage, lower rate of labor turnover, and fewer accidents among employees and by the prestige such a building will afford among clients and among the citizens of the community."

THAT American industry leads the world in protecting the health of its workers is evident from the great forward strides made in this field by industrial establishments in the United States, as reflected in a survey of the cost of health service in industry now being made by the National Industrial Conference Board, 247 Park Avenue, New York. According to the Board's investigation, as far as completed, on the average about 16% more money per employee is now being spent by industry on medical supervision than was being spent four years ago, when a similar survey was made by the Board.

Industry values the health of its workers. Talk to a man who has been in the army, and he will tell you that at no time of his life was his general health more scrupulously looked after than while in the service. Likewise, employers are concerned over the well being of their employees, to a degree where the question might well be raised whether if, in an up-to-date industrial plant, the worker's physical well being often is not better protected than it is in his home or wherever he may spend his leisure time. Care is taken in every modern establishment that ventilation and illumination are as perfect as technical science can make them, so as to enable the worker to do his best and without unnecessary strain. Shower baths and recreation grounds are provided more and more generally.

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TRUSCON MAINTENANCE MAP



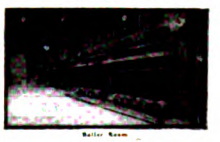
Maintenance Guide for Buildings and Equipment







Useful Information







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Offices and Warehouses in Principal Cities

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Free—Maintenance Wall Map—22" x 32"

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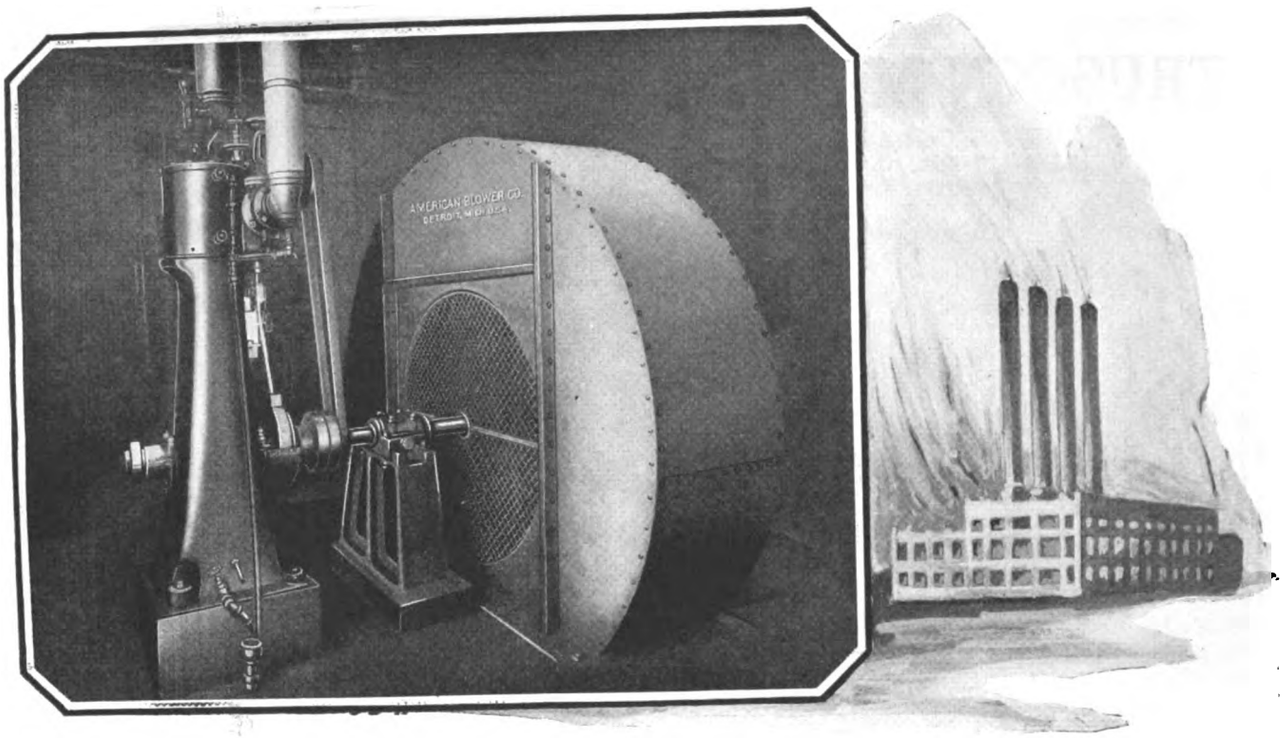
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Installing Blowers makes $14,500 saving!

Dan Gleason, Ass't. Chief Engineer of the Sanitary District, Chicago, says:

"Installing American Blowers just saved us $14,500, for otherwise we should have been forced to install another boiler to provide the required capacity.

"The layout of our plant was such that we could not locate all the boilers near enough to stacks to get the natural draft to develop the capacity required. Without the American Blowers the two most recently added boilers could develop an average of only 450 H. P. making a total of about 900 H. P., where with the American Blowers we were able to develop an average of 1,500 H. P.—a 600 H. P. increase. That represents the equivalent of another boiler.

"The system operated by the American Blower has also increased the efficiency of our boilers from the standpoint of evaporation of water per pound of coal. Just what these savings amount to we are not able to say. However, it is certain that they are fairly large.

"During our experience of 8 years with the American Blowers the repairs have been very nominal and what small repairs have been necessary, we have been able to do ourselves. American Blowers are certainly well built and the power used by the engine is not noticeable."

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

440

American Blower

"Sirocco" TRADE MARK

VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

Manufacturers of all Types of Air-Handling Equipment — Since 1881

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The Modern Industrial Doorway

(*Continued from page* 25)

in principle to the familiar shade roller. It contains a helical spring to balance the weight of the curtain. The shaft is supported at either end by a bracket fastened to the wall and is made of rugged construction 3", 4", 6" or larger pipe.

The counterbalance lies in the springs, which are ingeniously arranged so that one end of each is held immovable while the other end turns with the shaft and the descending curtain. This steadily increases the torsion and consequent pull of the spring.

Rolling door shafts are designed so that the lowering or raising door is counterbalanced at any point in its travel, and one man may operate a two-ton curtain, at a good speed, without undue effort.

Two channel-shaped side guides are furnished, fastened to either jamb. The edges of the curtain project well into the guides and make a good joint against the weather along each edge.

To further insure against the entrance of draught, storm or dust, a "D" shaped cover or hood is furnished over the shaft, formed of galvanized iron.

Uses or Rolling Doors

Rolling doors are essentially economizers of room and they require only a few inches of floor space. The coiled curtain takes 15", 16" or 18" of what is almost always waste room. Goods may be piled close up to the door on all sides, machinery installed by the door, runways pass along the wall, etc.

Warehouses, Piers and Sheds

Rolling doors may be placed in a continuous line so that the entire side of the building can be opened at once. They may be mounted on 6" wide posts, though 8" is preferable.

Railroad Entrances

Here a door is required about 15 feet wide and 22 feet high. Such a door can be operated by hand, though motor drive is preferable. It will raise or lower in less than half a minute. Any other door would either be impossible to work, or be too clumsy, heavy and dangerous to justify the installation.

Double track entrances require a door about 30 feet wide, and cars coming in at a sharp angle may even need a 45 foot clear opening. It is doubtful if any other door can be expected to do this work, while a rolling steel door is particularly fitted for it.

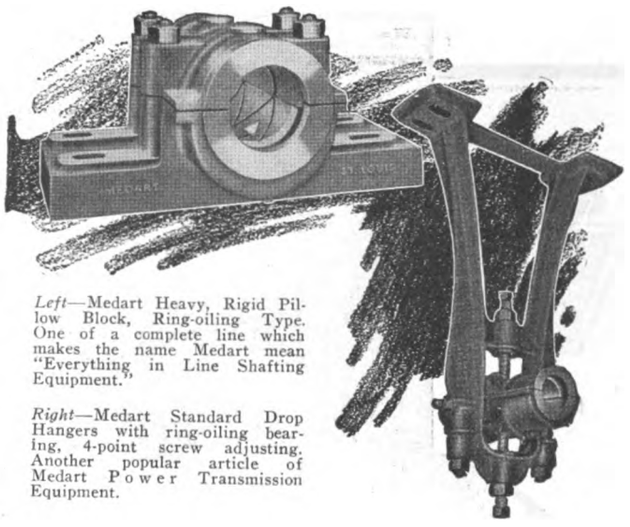
Marine Towers and Grain Elevators

A very high, narrow door is needed. Rolling doors have been furnished 125 feet high. The coil, when the door is up, may reach 48 inches in diameter, but this amount of room is usually available at the top of the opening. A motor drive should be used.

Core Ovens—Dry Kilns

Rolling doors are in large demand for this type of work on account of their economy of space and their high heat resistance. The curtains may be made to fit closely in the side guides, with special end locks, so that

(*Continued on page* 57)



Left—Medart Heavy, Rigid Pillow Block, Ring-oiling Type. One of a complete line which makes the name Medart mean "Everything in Line Shafting Equipment."

Right—Medart Standard Drop Hangers with ring-oiling bearing, 4-point screw adjusting. Another popular article of Medart Power Transmission Equipment.

MEDART

Bearings and Hangers

Medart Bearings and Hangers are substantial—sturdily built to safely carry more than the loads usually imposed upon them. They are sufficiently heavy to maintain proper rigidity under operating vibration and can be easily and quickly erected, adjusted and aligned.

Pillow Blocks and Bearings

Pillow Blocks and Bearings are made by Medart in a wide variety of types for general line shafting requirements—heavy rigid ring-oiling types (with or without adjusting base plates)—wick-oiling and plain oiling types—common flat boxes—solid journal boxes—ball and socket pillow blocks and open adjustable types. They can be supplied in any required size, and are lined with virgin bearing metal best adapted to speeds and pressures generally encountered.

Standard Drop Hangers

Standard Medart Drop Hangers form a rigid "road bed" for line shafting in general service. Medart Hanger Frames are specially proportioned for strength and are fitted with 4-way adjustment screws with jam nuts for maintaining proper alignment of their bearings. They are equipped with Medart hanger bearings, either ring, collar or wick-oiling type. We are also prepared to furnish Universal Drop Hangers, Single Brace Hangers, Sling Hangers, Extension Hangers and Closed Post Hangers.

Everything in Line Shafting Equipment

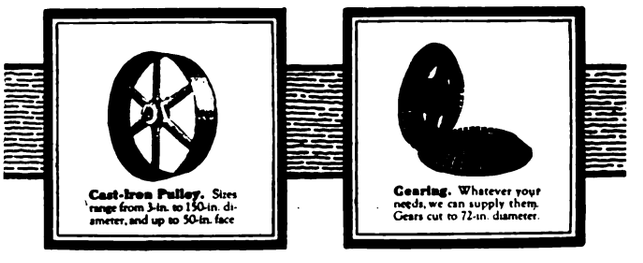
Besides Hangers, Bearings and Pillow Blocks, Medart makes a complete line of Power Transmission Equipment. Concentrate your purchases and fill all your transmission requirements through Medart Catalog 43, with discount sheet. This affords a simple, direct method of economical buying. Engineer's estimate furnished on your specifications without obligation.

THE MEDART COMPANY

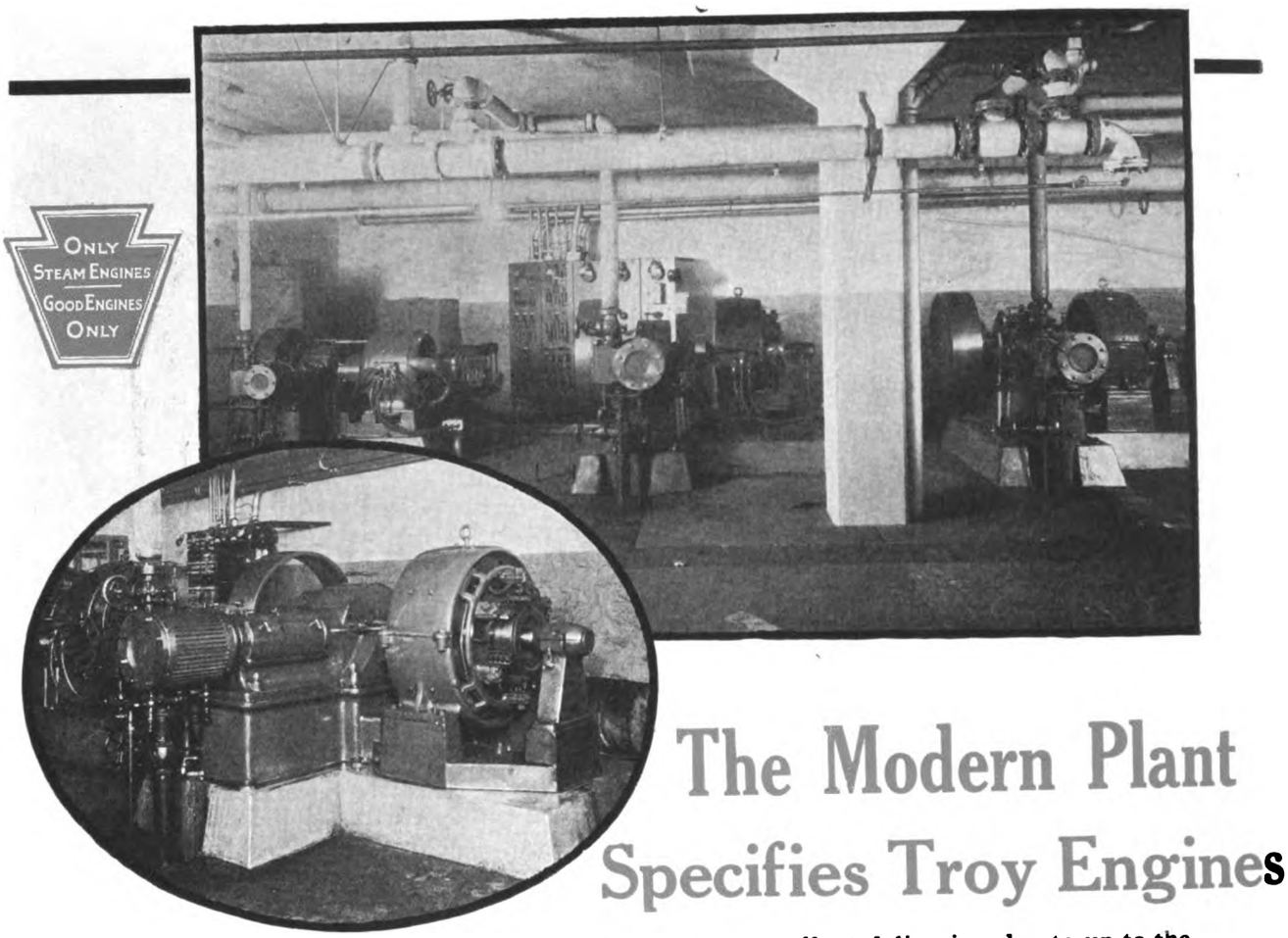
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The Modern Plant Specifies Troy Engines

For Driving
Fans
Stokers
Blowers
Pumps
Generators

Modern requirements make greater demands from every piece of equipment.

Executive control of the power plant results in more careful selection and while price is considered, quality and performance are absolutely essential.

Considered from all three angles—quality, performance and price—many plants have chosen Troy Engines, because only they measure up to all requirements. Thus, many industrial power plants, where economical and efficient methods are in force, have installed three and more Troy Engines for their power requirements.

Here is a quality product that is sold at a moderate price, with excellent deliveries, due to up-to-the-minute manufacturing methods, long experienced men and favorable location of our shops. Furthermore, 33 years have been devoted to engine building and good engines only.

Troy Engines have the self-compensating, steam tight valve which automatically clears the cylinder of any condensation. They are oil and dust proof—entirely enclosed. Bearings are always assured of a continuous supply of oil through the Troy Automatic lubricating system.

Built in sizes up to 200 BHP both in horizontal and vertical types.

Write for Troy Catalog.

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360 Dufferin St., Toronto, Canada

TROY ENGINES

Dependable Power with Absolute Safety

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(*Continued from page* 55)

draught is practically eliminated. A special baffle plate in the hood will prevent draught over the coil.

Loading Platforms and Concourses

Rolling doors are in frequent use here. The exterior openings either must be placed very close together for efficiency; or if single, space must be economized. Automatic rolling doors, described below, usually protect the building proper from the loading spaces. These openings are generally set closely side by side.

Garages

The economy of space here is often invaluable. Sliding doors prevent the use of store fronts, show windows and offices, on one side at least of the entrance. A garage floor should pitch to the street, which would eliminate swinging doors, even if not obviously wasteful of floor space.

Ramp door requirements practically eliminate any other type of door.

The fire hazard alone will usually justify the extra cost of the rolling steel door over wood.

Boiler Fronts, Transformers and Ventilating Systems

Rolling doors, with their adaptability to small space and clearances, are ideal here. Often the entire layout would have to be revised if rolling doors were not available.

Large Doorways

The safety factor in the curtain is fifty or more. The safety factor in the shaft, brackets and guides is similarly very high. There is no heavy mass spread widely overhead to threaten falling. On account of their perfect counterbalance the biggest rolling doors operate with surprising speed and ease. They are tight all round against the weather, and a stop to fire or thieves.

Doorways in General

While first cost is more than wood, rolling doors are made to last. The only appreciable wearing points are at the two ends of the shaft, the main bearings. The shaft turns slowly, and proper bearings are good for a hundred years. Good paint, combined with the original galvanizing, will protect the steel indefinitely. Doors installed fifty and sixty years ago are still giving satisfactory service.

A rolling door, damaged by heavy truck or cars, is easily repaired by replacing a few damaged slats. They are resilient, and will give under impact, so that the knocking down of a whole door is extremely rare.

Rolling doors can be placed on nearly any opening. They require practically no special construction. They can be put under the lintel and between the jambs; on the outside to operate from the inside, and vice versa. They will fasten to steel, wood or any masonry. They require no ceiling, or side, tracks, and can be made entirely self-contained by fastening the brackets to the extended side guides at their tops. The floor space saved by installing rolling doors will earn dividends as long as the building stands.



A Sugar Refinery
Uses 36 Crescent Trucks

A STRIKING testimonial of the ability of electric industrial trucks to cut handling costs is afforded by the W. J. McCahan Sugar Refining Company installation of 36 Crescents at their Philadelphia plant.

The bulk of the raw materials in this industry complicates loading and unloading problems tremendously. Great gangs of cheap labor were formerly employed for this job, but cheap labor can no longer be had.

The introduction of electric trucks, however, actually reduced the former costs of handling, when labor was cheap, and in addition, helped increase the capacity of the plant by more prompt deliveries.

Send for illustrated catalog of Crescent trucks today.

CRESCENT TRUCK CO.
165 North 10th St.
LEBANON PENNA.



It Pays to Crescentize

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Now you can get a high-grade *dial* thermometer at a *saving of one-third or more* over other dial type thermometers.

You may wonder how we are able to bring the price of the Motoco down to about the cost of high-grade armored glass-tube thermometers. Let us explain.

By eliminating hair springs, gears and other delicate and expensive parts usually found in dial thermometers, we materially cut the manufacturing cost of Motoco Thermometers. And by designing special machines, which greatly reduce manufacturing costs, we further lowered the cost. *This saving we pass on to you.*

We *guarantee* every Motoco Thermometer to be accurate and free from defects, so you take no chances.

Furnished for temperatures between minus 40° and plus 750° F., with rigid stem or 10 ft. of armored tubing.

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***The* MOTO METER CO., Inc.**

Industrial Thermometer Division

10 Wilbur Avenue

LONG ISLAND CITY, N. Y.

Made by the manufacturers of the famous Boyce Moto Meter



MOTOCO

INDUSTRIAL THERMOMETER

What Price Black Diamonds Now?

(*Continued from page* 20)

2. Get more heat energy from your present fuel, and consequently burn less of it.

And the problem, either way you tackle it, has a two-sided solution:

A. Better methods of operation and management, and

B. Better equipment.

By "better methods of operation and management" is meant the intelligent purchase of fuel to suit the conditions of the load and equipment, wise supervision of firing and upkeep, and constant checking of equipment to reduce avoidable losses.

By "better equipment" is meant the installation of the proper units to suit all operating conditions, as determined by a systematic analysis of the fuels available and the power required.

What kind of coal are you burning now? Is it the cheapest steam producer you can use consistent with the kind of equipment you have? Will minor changes of equipment enable you to use a cheaper fuel? Do you know all these things with certainty? If not, you are missing a good bet.

It is not difficult to analyze your steam-making requirements to determine the right coal for your plant. It takes time and mental effort; but the results will be well worth while from the standpoint of your pocketbook.

First become acquainted with some of the practical characteristics of coal, if only to know how the different kinds will behave in your boiler room.

Reduced to general terms, coal is composed of five well-known substances: water, tar, dirt, sulphur and fixed carbon. It is in the varying percentages of each of these five substances that all coals differ.

Water is the least important element, and for our present purposes may be dismissed with the thought that it takes a certain amount of heat to drive the water out of the coal being burned, and that therefore the dryer the coal, the greater its heat value.

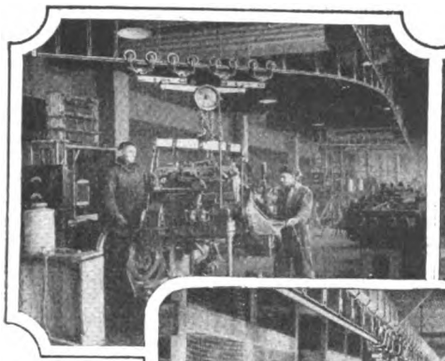
Tar, or volatile matter, is that element which distills off in the form of smoky gases while the coal is burning. There is heat value in these smoky gases, and where the tar content of the coal is high, as in the softer coals of the West, it is essential for economical combustion to have the furnace well proportioned, so that too much of this heat is not wasted.

Dirt, or ash, is an unavoidable nuisance. It is unburnable, it must be removed from the fuel bed regularly, and is a constant source of expense. Since every 1% of ash means 20 lbs. to the ton, paid for as coal, and on which freight rates from the mine are levied, it is seen that high ash content coals are costly even when the price is low. And high ash content coals frequently have a low ash fusion temperature, which means that high temperatures in the furnace will cause costly and destructive clinkering.

A high percentage of sulphur will cause corrosion in the bunkers and cars and on the grates; and will make the storage of coal unsafe, so it is wise to see that the sulphur content of the coal you buy is low.

(*Continued on page* 62)

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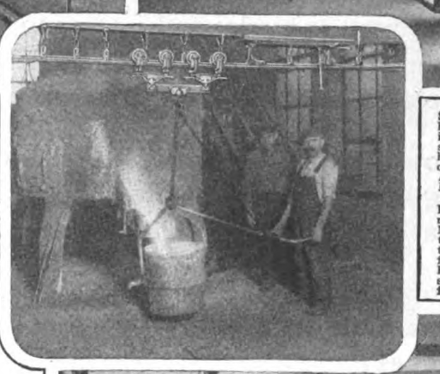
(Above)
Setting 1700 lb. motor quickly, easily, safely. Monorail can be routed overmachines and heavy parts spotted on them. Allis-Chalmers Mfg. Co., Milwaukee, Wis.

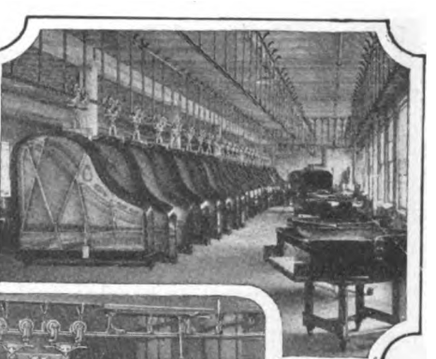


(To right)
Beautiful, lustrous, fragile chinaware—handled on Louden Monorail. Finished ware being taken from inspection room to stock department. Pottery of Lenox, Inc., Trenton, N.J.



(Above)
Conveying 20 shawls of window glass from aslitting shed to flattening ovens, quickly, with no danger of breaking. American Window Glass Co., Pittsburgh, Pa.





(Above)
Saves time and handling in varnishing. Storage tracks save space and rehandling between coats. Costs cut 1-3. Apollo Piano Co. De Kalb, Ill.

(To left)
From furnace to moulds over Louden Monorail with one-third the gang. Less than $5.00 in 2 years for maintenance. Burd High Compression Ring Co., Rockford, Ill.

"Louden Monorail Saves Us $5,000 a Year"

This is reported by the Griess-Pfleger Tanning Co., Waukegan, Ill.—and scores of other plants, in many widely varied lines of production, likewise give credit for large savings to Louden Monorail as against old methods of man-handling material.

In practically every line of industry, where loads up to 2000 lbs. must be moved, you can profit by using

LOUDEN

OVERHEAD CARRYING EQUIPMENT

In large plants and in small ones this active material handling equipment which is so moderate in cost, has proved itself to be one of the greatest of all production economies—a saver of labor, time, floor space, floor wear, rehandling expense and breakage. "We save $1544 a year with our Louden Monorail System, or 100% on the investment," reports the H. R. Mallinson & Co., Inc., Astoria, L. I. "It reduced our pouring gang from 20 to 6 men," is the word from the International Motor Co., New Brunswick, N. J. And the Martin-Parry Corporation says that "Louden Monorail used at York, Indianapolis, Lumberton, and in 18 or 20 of our branches is saving us, roughly, $8,000 to $10,000 a year." These reports are typical of many others in our files.

You should see one of these amazingly active Louden Systems at work to thoroughly appreciate how it can and does reduce production costs. Smooth-running trolleys on a strong, safe track with sturdily built switches that are quickly and accurately operated, keep production humming and sing a song of savings that will surely warm your heart.

Let us refer you to an installation in your vicinity or advise one of our nearby Engineers to call and go over your plant for the purpose of making a report to you. Without obligation, of course. Set a date to suit your convenience.

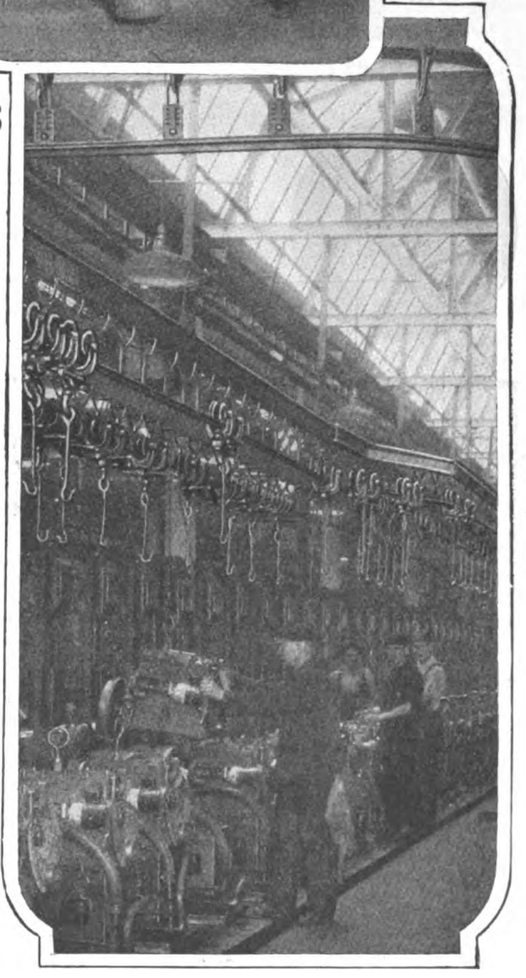
Send for Louden Overhead Book

It pictures many installations in various industries—from a few feet of track **to many miles. Tells an interesting story of how other concerns have cut production costs. Send for your copy.**

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Branches in Principal Cities



Several miles of Louden monorail in one of the biggest motor plants in the country. It is used in continuous operation handling raw materials, parts finished and complete products from supply to machines, from machine to machine, and finally to warehouse or shipping platform. This installation has made possible increased quantity, speedier work and a lessened cost of production.



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Motors with "Norma" Precision Ball Bearings free you from motor bearing troubles—most of which are due to neglect to oil the common sleeve type bearing. "Norma" magazine lubrication protects you against this hazard.

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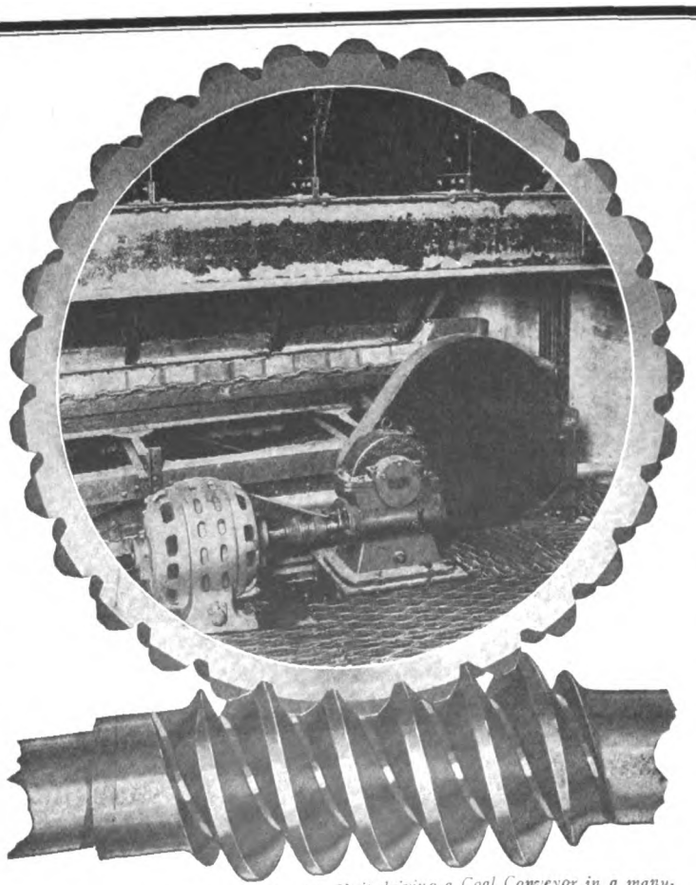


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There is a Cleveland representative close to you who will be pleased to call.

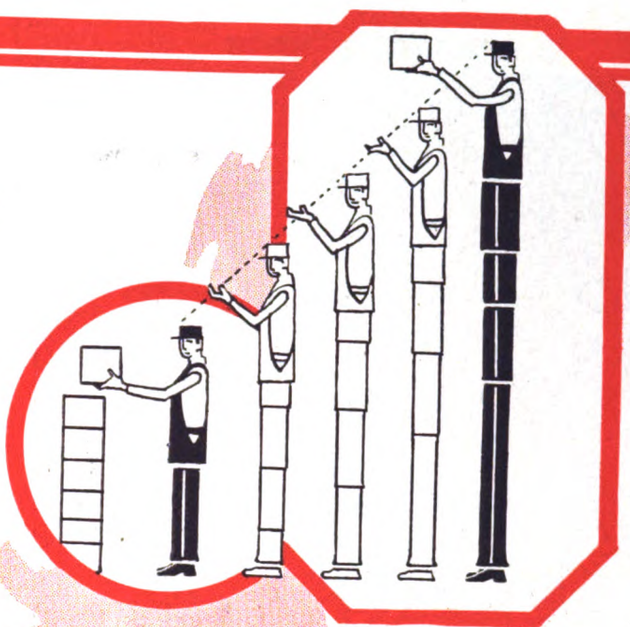
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WORM GEAR
REDUCTION UNITS

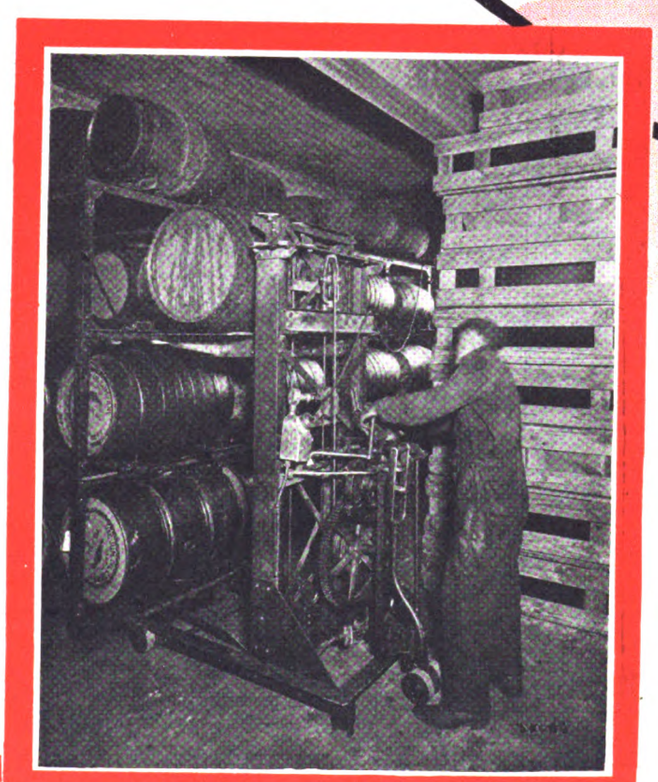
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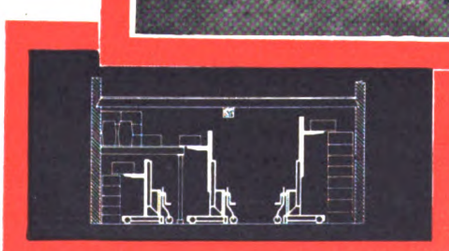
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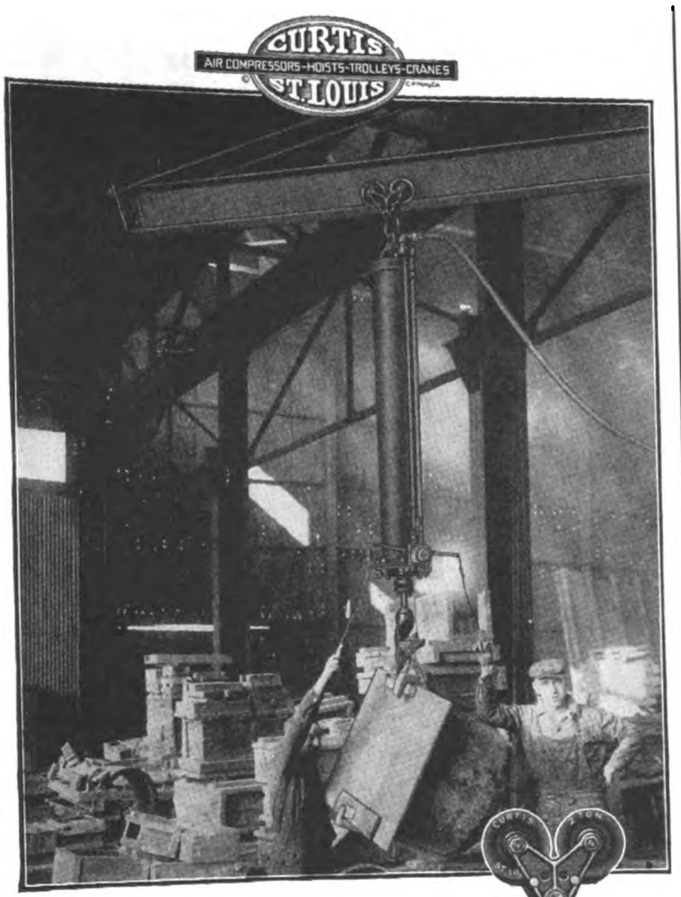
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CURTIS
1854 71st ANNIVERSARY 1925
Air Hoists *and* Trolleys

(*Continued from page* 58)

The fixed carbon, or coke content, contains the real heating value of the coal. The percentages of fixed carbon in coal are highest in the good coals of the East, and lowest in the poorer coals of the West.

Heating value is figured on the number of B. t. u. (British thermal units) per pound of coal. This is highest when the fixed carbon percentage is highest (combined with a certain percentage of volatile) and when the water, dirt and sulphur contents are least. Such coals, of course, command high prices.

The highest priced coal, however, is not necessarily the best coal to burn on the basis of low cost steam production. The equipment and method of firing will often make it possible to use much cheaper coals just as effectively, and with greater economy. The factors which enter into the determination of the right coal to burn in any plant to produce steam at the lowest cost, are discussed in the April issue of INDUSTRIAL MANAGEMENT. Every plant manager must solve this problem individually.

There are five broad classifications of coal mined in the United States. Their chief characteristics are as follows:

Anthracite: Mined entirely in Eastern Pennsylvania. A hard, dry, glassy-black coal, slow-burning, free-coking; containing very little tar (less than 2%) but more fixed carbon than any other variety. Being smokeless, it is remarkably well adapted for domestic use, and this market absorbs all the larger sizes, such as broken, egg, stove, and chestnut. The commercial sizes such as pea, buckwheat, rice, barley and culm are considerably lower in price, yet have the same heat value as the larger sizes.

Semi-bituminous: Mined in eastern Pennsylvania, Maryland, West Virginia, Virginia and Oklahoma. This is a fairly hard "soft" coal—the highest in heating value of any coal, but since it contains about 14% of tar, or volatile, it is slightly smoky.

Bituminous: Mined in Pennsylvania, Ohio, West Virginia, Kentucky, Alabama, Tennessee, Indiana, Illinois, Iowa, Missouri, Oklahoma, and Texas. The eastern bituminous is superior in heating value to the western. It is brownish-black and quite soft. It contains about one-third volatile matter, and is therefore very smoky. The eastern bituminous, with 52% fixed carbon and 8% ash burns well on underfeed stokers, while the western type, with 42% fixed carbon and 16% ash requires overfeed, or traveling chain grate stokers, so that the ash will not be agitated in burning the fuel.

Sub-bituminous: Mined in Wyoming and Montana, is like the anthracite, black and glossy, but is actually a soft coal. It is the lowest of all coals in ash content, but the highest in volatile (42% tar). The water content is also high (23%). Because of the high volatile and water content, the heating value is only about two-thirds of any of the coals above mentioned.

Lignite hardly deserves the name coal. It is more than one-third water, more than one-quarter tar, has almost 10% dirt (ash) and only 31% of fixed carbon. It is mined in three areas in the United States—Iowa, Texas, and Mississippi-Alabama, but also occurs in Northwestern Canada and Alaska. It is extremely difficult to burn, but with special equipment can be used economically.

Two phases of coal mining may be of interest to the

(*Continued on page* 64)

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One man now handles some 5000 items of tools in about half his time and does it better than it could possibly be done the metal check way.



OUT WENT THE METAL CHECKS—

Read what Mr. Charles F. Loew of the Loew Manufacturing Company has to say about the McCaskey Tool Check:

"Up to about 2 years ago we used the metal check system for keeping track of tools drawn from the crib. Metal checks are easily lost or misplaced, can be forged by a dishonest workman, and of course furnish no record of the length of time a man has had a certain tool.

"Our McCaskey System has eliminated these difficulties. With it one man handles some 5,000 items of tools in about half his time and does it better than it could possibly be done the metal check way. When a man draws a tool he signs a ticket bearing the tool number, his own number, the date, and signature of the tool-crib keeper. The McCaskey carbon backed form makes a duplicate at the same time. These two tickets are filed in the cabinet under the tool number and workman's number. When the tool is returned the workman is handed the tickets which he destroys."

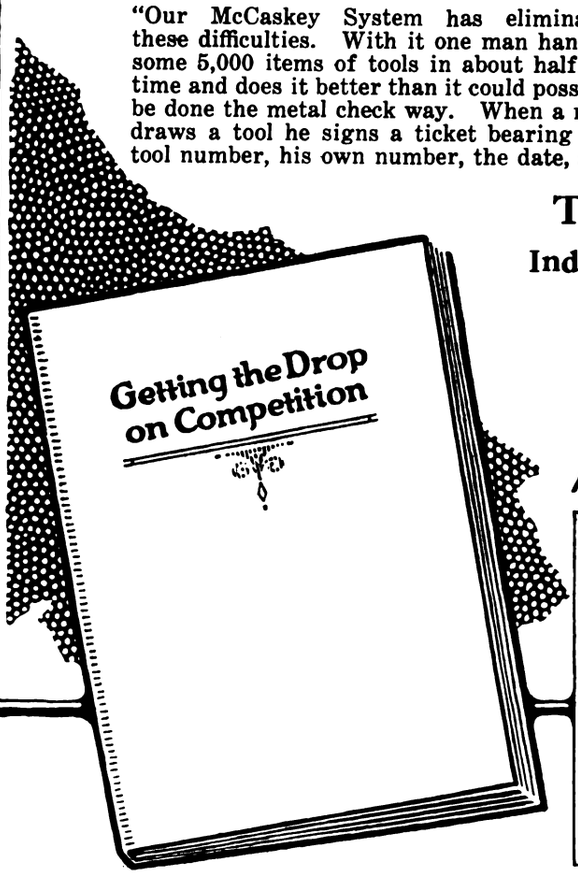
What the McCaskey does for this company it is doing for many, many others. The flexibility of the McCaskey Industrial Control System—and it is flexible because it is merely a basic idea—permits the application of the idea to any form of business.

Write today for our booklet, "Getting the Drop on Competition." It contains some valuable information. And it's free.

THE MCCASKEY REGISTER CO.

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You may ship us five gallons of Skybryte on trial and one regular 75c Skybryte brush FREE. We will use enough to make a thorough trial—enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for five gallons of Skybryte at $3.00 per gallon, F. O. B. Cleveland.

Skybryte in bbls. $2.50 per gallon freight allowed.

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(*Continued from page 62*)

buyer of coal. One is the actual cutting out of the coal from its bed underground, gathering in mine cars, and hoisting through the shaft to the top of the tipple. The other is the preparation of the coal for the market, which starts at the point where the mine car, filled with coal, is dumped at the tipple.

The accompanying illustrations make many of these points clear. The headworks at a coal mine are built high for the purpose of dumping the filled mine car at the top of a series of screens which sort the coal into various sizes as it falls down by gravity. The railroad cars into which the sorted coal finally falls run under the chutes fixed to the lower ends of the screens.

At various points along the line of travel of the coal from the tipple to the railroad cars slate, stone and other impurities are picked out and cast aside, either manually, as shown, or by mechanical picking apparatus. Many mines also wash the coal, to remove surface dirt, dust, ash, and sulphur.

The degree of attention given to the physical preparation of the coal has a marked influence on the chemical process of combustion. Clean, even-sized coal produces hotter fires, and often a slightly greater price paid for coal well prepared produces economies at the power plant not otherwise obtainable.

Know your coal! is good advice for every power plant executive. It is the first step in knowing the full possibilities of your plant. Ferret out the hidden profits there, and you will be surprised at the way in which your cost of production will drop.

SPECIAL attention will again be given to the wide range of engineering courses this year at the Summer Session of the Carnegie Institute of Technology. The summer work, which will cover both theoretical class room instruction and shop practice, is outlined, according to an announcement, to be of special benefit to undergraduates and to those engaged in engineering work who feel a need for more technical training in their respective fields. Courses of six and eight weeks will be given, beginning June 15.

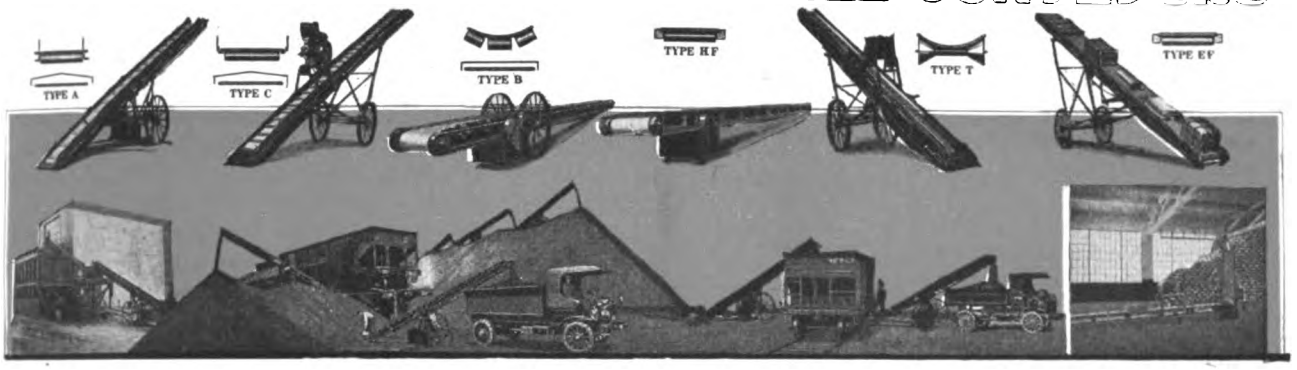
The College of Engineering will give courses in Chemistry, Physics, Mechanics, Engineering Drawing, Descriptive Geometry, and Surveying. A special short course in Coal Mining will be given in coöperation with the U. S. Bureau of Mines.

In the College of Industries courses are scheduled in Plumbing, Welding, Mechanical Drafting, Sheet Metal Work, Patternmaking, Machine Shop, Woodworking, Cabinetmaking, Electricity, Radio Communication, and Drafting. Subjects in general studies will include English, Economics, Mathematics, Psychology, and Commercial Law.

Four research fellowships in metallurgy are being offered for next year at the Carnegie Institute of Technology and the Pittsburgh Experiment Station of the United States Bureau of Mines, according to an announcement. The research program for next year, the announcement points out, will be a continuation of the plan for research in metallurgical problems effected a year ago between Carnegie Tech, the Bureau of Mines, and Advisory Board composed of men prominent and active in the metallurgical industries of the Pittsburgh District.

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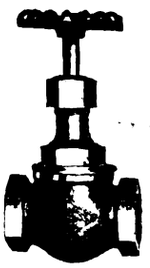


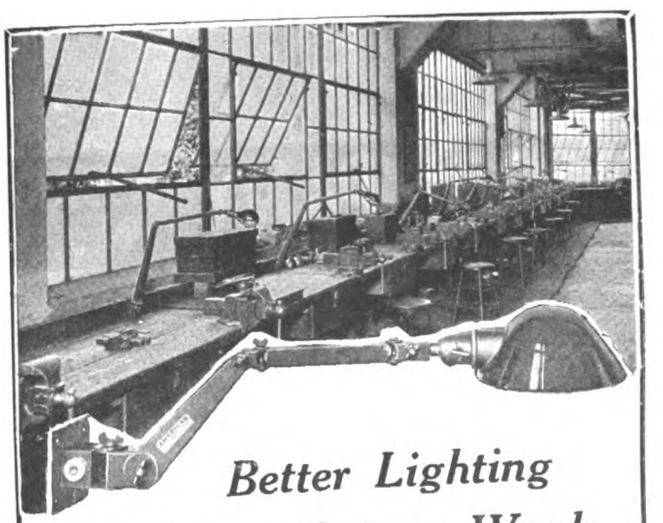
Fig. 106. — Screwed, Standard Bronze Globe Valve.



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It describes Jenkins Valves for use in industry.

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864



Better Lighting Produces Better Work

An American Fixture placed at a bench or over a machine intensifies the light to exactly the place it is needed most, without throwing the glare into the face of the employee.

American Fixtures are designed by lighting engineers who have demonstrated that the right fixture in the right place not only safeguards the health of the employee, but enables him to produce better work and increases his efficiency from 25% to 50% in production volume.

Made in six styles. Catalog and prices on request.

American Fixture Company
230 West Water Street
MILWAUKEE WISCONSIN



"If Winter Comes"

(*Continued from page* 17)

vania and New Jersey on the 17; and five inches in all the New England states, except three inches in Vermont. The storm of June 17 was as severe as any that ever occurred in the depth of winter. It began about noon, increasing in fury until night, by which time the roads were impassable by reason of the heavy snow drifts. Many were bewildered in the blinding storm and were frozen to death. . . . There was a heavy snowstorm August 30. . . . The year 1816 had neither spring, summer nor autumn. The only crop of corn raised in that part of Vermont that summer was saved by keeping bonfires around the cornfield night and day." *

History has been known to repeat itself. And when present-day weather experts and scientists at the Smithsonian Institution incline to the belief that during 1925, 1926 and 1927, it may do so, we of the uninformed and unstudied do not flatter our intelligence by hastily pronouncing their inclinations as absurd or their conclusions as baseless.

Through recent developments in the science of weather forecasting, it is now possible to predetermine the general trend of weather two and three years in advance. Since 1905, weather experts have found that the penetration of the sun's heat does not affect our climatic conditions immediately; rather, that the sun's heat intensity is delayed in its earthly effect from one to three years. Since that time, also, they have been studying the "solar constant" continually; discovering that the normal average is approximately 1.94 gram calories of heat per square centimeter of earth's atmosphere per minute. That is the way they measure "solar constant," and according to their records 1.94 is the normal average.

Sun's Heat Below Normal Last Year

Since 1922 these solar radiation values have decreased markedly. From May 1922 to June 1923, the "solar constant" was continually below 1.92 and since February 1922, the constant has not reached the normal 1.94. During the past three months the trend has been upward and only recently (latter part of December) the normal average of 1.94 was reached.

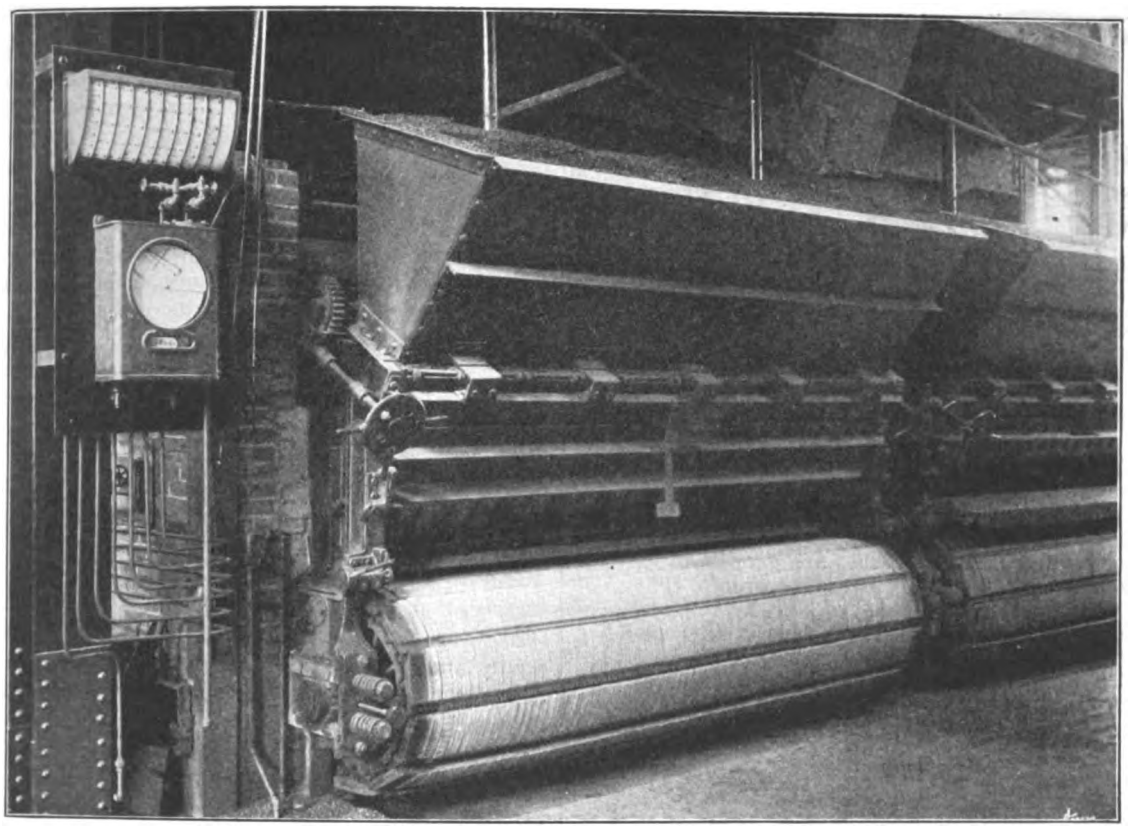
The material lowering in the sun's heat penetration during 1922 is given, by Mr. Browne of the Institute, as the reason for our chill, backward and erratic summer of 1924. The low tendency of the constant throughout 1923 and 1924 is given as the reason for the prediction that next summer and the one following will be increasingly cold, with a possibility of a return to the 1816 conditions—"a year without a summer."

Proof of the value of such research is to be had in the present ocean temperatures. Scores of vessels reported, during 1924, ocean temperatures approximately twelve degrees below normal. Extreme snows and severe weather were reported throughout Scandanavia, Northern Europe, Scotland, Australia and New Zealand during 1923-4. Unprecedented floods have been experienced in certain parts of South America and Africa and during July, last, light frosts occurred in Illinois. These conditions are effects of the solar constant decline, according to Mr. Browne.

*Credit and thanks for this information must be extended to C. F. Talman's *Meteorology* and Thomas Nelson & Sons.

(*Continued on page* 68)

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NOT AN EXPENSE—AN INVESTMENT!

The installation of Bailey Boiler Meters and Multi-Pointer Gages is an investment—an investment which gives a generous return. They earn substantial dividends for their users by giving records of boiler operation in such a way as to almost compel the reduction of losses.

Considered in relation to the results they produce, the cost of installing Bailey Meters is trifling. During the first year of operation they have been known to save the user several times their cost.

If you are looking for an investment which will give you unusual returns why not investigate the possibilities of installing Bailey Meters in your plant?

Bulletins will be mailed upon request.

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ANY Dart Union that springs a leak through any defect in material or workmanship will be replaced with two Dart Unions of the same size without charge.

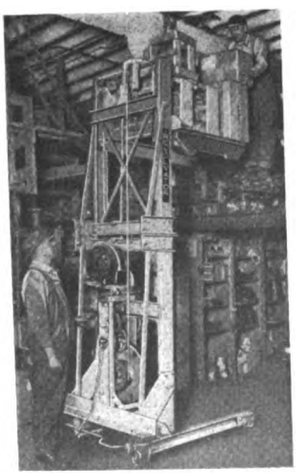
This guarantee is a further assurance of economy in the use of steam and steam line maintenance.

Dart Unions stay tight because the two bronze metal ball joint seats are ground to fit absolutely tight and are pressure proof. The long, sharp threads, cut to standard sizes, mean sure and easy fitting. No packing required.

Use Dart Unions and conserve your steam costs. Catalog—Write for it.

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Solve Your Storage Problem with a Revolvator

You won't need so much floor space if you pile your goods right up to the ceiling. Get a Revolvator—a hand power or a motor driven or a combination hand and motor operated type and your storing problem will be solved.

All the leading industrial concerns use Revolvators—the General Motors Co. operate 46 Revolvators. If you store goods it will pay you to buy a Revolvator.

Send for Bulletin IND and get the details.

Portable Elevators Liftrucks Barrel Racks

REVOLVATOR CO.
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(Continued from page 66)

Considering that the weather-man joke passed into oblivion along with the mother-in-law and horseless-carriage wheezes, it is my belief that serious thought should be given the available facts. With the highly developed instruments now employed, and with the cumulative knowledge and experience on the part of the experts, such conclusions, however sombre, should be accorded an open mind. For it will be recognized, upon thought, that completely cold summer is not necessary to blight our crops and throw the northern half of the United States into widespread disaster. A killing frost in June followed by one in July would be sufficient to spell destruction to all agricultural products, upon which we are dependent, at least for food.

Professor Cox, Senior Meteorologist of the United States Weather Bureau shows no alarm at Mr. Browne's prediction, and therein lies a ray of hope and cheer. However, Prof. Cox hesitates, even refuses, to heavily discount Mr. Browne's statements. He points out, merely, that Mr. Browne changed instruments and location of research during his "solar constant" measurements and that such a change might have affected the "apparent" decline which ranged upwards of 2½ degrees.

However, it has been quietly reported that several large and influential members of the electricity and gas producing fields are already laying plans for such a three year emergency. Action of this kind and by this caliber of industrial concern gives us incentive to think of our own industry and of our own business.

Effect Upon General Business

How would continued cold weather effect industry? Obviously such a question can more easily be asked than answered. However, knowing that cotton is raised in states least likely to be affected by the cold weather and that extreme weather would be necessary to deprive Montana wool and the cattle of the western plains of forage, the textile mills and the packing plants would probably endure no shortage in the source of raw material. This assures us of an adequate supply of clothing and meat. Indeed, industries of all kinds located in the Southern states would probably be in contrast to the flour milling industry of the North, in that they would probably experience no interruption in manufacturing activity. Theirs would be a problem of production rather than adjustment. Industries of the North would face a problem entirely different; a problem so varied as to be individual with each plant, and for that reason impossible of discussion here. Certain it is, however, radical production increases would be necessary, for with plants operating intermittently, maximum production would be required during the uncertain periods of operation.

Radical production increases, we have ably demonstrated, can be made. During the last war every industry keyed itself to maximum service. However, a winter emergency such as the one described and suggested would be unlike, in many respects a war emergency. For one thing, the war imposed a demand for the immediate material supply for five or six million men. With some variations, the winter emergency would increase that demand ten fold, for there would not be six million to care for, but sixty millions—the population of the

(Continued on page 72)

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TWO THOUSAND
MICHIGAN INDUSTRIES
Protect their Employees Against Infection By Using

In 1923 there were 84,747 wounds reported to the compensation board of Pennsylvania. Five per cent of these (4,212) were infected. The average time lost in non-infected cases was fourteen days. In infected cases it was forty-six days. The loss in dollars, days and lives totalled $354,000; 185,000 days' work and thirty-eight lives, in addition to unmeasurable suffering, anxiety and crippling — largely preventable and unnecessary.



CRESOG is recommended for minor injuries in the absence of a physician and eliminates the possibilities of infection.

CRESOG does not burn or destroy tissue, or discolor the skin like Iodine, and the dressings stay moist 12 to 24 hours.

Happy and contented workmen produce the greatest results. Why use strong irritating preparations that discolor the skin?

CRESOG is furnished in 4-ounce and Gallon sizes. Place your First Aid Department on a business basis. Instruct your Purchasing Agent to order a trial size today.

CRESOG LABORATORIES COMPANY

439 EAST FORT STREET

Detroit, Michigan

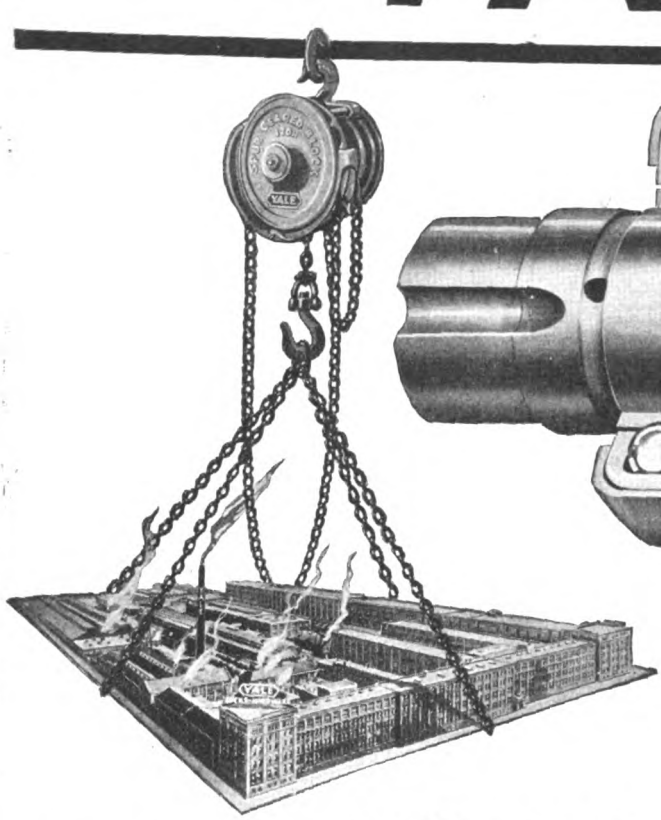
Enclosed find $1.00 for 4-oz. trial size of CRESOG. If not satisfactory after 60 days use you agree to refund our money.

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City ..... State .....

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TRADE **YALE** MARK





The Load Sheave

The Heart of the Block

In Yale Spur-Geared Blocks the load carrying sheave rotates on ball bearings.

Less work lifts a greater load, more quickly.

Yale Ball Bearing Spur-Geared Blocks are the easiest, most efficient and serviceable because the substantial load-sheave ball bearings of chrome-vanadium steel eliminate sliding friction where friction is greatest.

This is an important point in chain block construction. And *every* detail of a Yale Block is worked out with the same exacting care. Yale Blocks are the standard of comparison.

The Yale & Towne Mfg. Co.

Stamford, Conn., U. S. A.

YALE MADE IS YALE MARKED

Ball Bearing Spur-Geared Chain Blocks

Yale Material Handling Equipment includes Spur-Geared, Screw-Geared, and Differential Chain Blocks, Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment. To acquire locking control, security and convenience throughout the factory, use Yale Master Keyed Locks.

YALE
Chain Blocks, Electric Hoists } For Lifts
I-Beam Trolleys, Industrial Trucks } For Shifts

YALE Hoisting and Conveying Systems

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General Motors Company building at Detroit, Michigan. Much of the concrete floor in this building is dustless and wear-proof because it has been hardened with Lapidolith, the liquid chemical floor hardener. The wood floors of the four-story laboratory connected with the main building, are also smooth, hard and sanitary, for they have been treated with Lignophol, the preservative dressing for wood floors.

Plant maintenance— how to reduce the toll

You can't avoid a certain amount of expense in keeping buildings repaired. But you can reduce this expense by following the suggestions on this page.

FLOORS—Walk on a concrete floor and it seems impenetrable. Yet, unless hardened, that floor in time will begin to dust and wear. If a concrete floor is treated with Lapidolith, the liquid chemical floor hardener, however, it will never dust or wear.

Lapidolith penetrates the concrete when flushed on a floor. It binds the loose particles together, fills the empty spaces, and hydrates the free lime. By chemical action the coarse structure is changed to a fine, dense, even surface of crystalline formation. This surface is permanently dust-proof, wear-proof and waterproof. If needs no further attention. Lapidolith can be applied on either old or new floors. If treated at night the floor is ready for business by morning.

If your floors are of wood you can avoid a lot of trouble by an application of Lignophol. This preservative dressing penetrates the wood and restores its natural oil and gum. It prevents the wood from rotting, splintering or drying out. It does away with the need for frequent applications of floor oil and produces a smooth, hard, dustless surface that lasts for many years.

PAINTED SURFACES—Painting time does not come around so often when interiors are painted with Cemcoat. One reason for this is the durability of this paint; another is that it stays white long after other paints turn yellow. A Cemcoated surface is bright and cheerful. It can be washed over and over again and each time the underneath surface comes forth as fresh and white as the day the paint was applied.

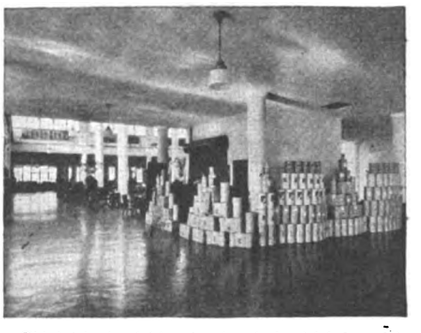
Because of its body Cemcoat usually requires one less coat. Furthermore, it adheres to a brick or concrete wall just as easily as to wood. This is because Cemcoat is not affected by free lime, always present in plaster or concrete and which is fatal to the life of paint. Cemcoat is made for exteriors as well as interiors in white and colors and in gloss, eggshell or flat finishes.

ROOFS—If your roof leaks, stop that leak with Stormtight—the thick, elastic waterproofing compound that sticks to any surface wet or dry. Stormtight permanently repairs a leak in a few minutes. It does more than that, for if you have an old roof about due for replacement it will save you the cost of reroofing. An old leaky roof that is about due for renewal can be made as good as new by a coat of Stormtight. It is easy to apply; it goes over any material; it lasts for years.



The owner of the plant above is saving himself hundreds of dollars by covering his old roof with Stormtight instead of re-roofing. Stormtight will repair a single leak in a few minutes, or it will lastingly waterproof an entire roof as effectively as though you covered the surface with a continuous sheet of thin rubber.

EXTERIOR WALLS—Water will not seep through walls even in the hardest rain storm, if the outside of your buildings is treated with Hydrocide Colorless. This waterproofing material preserves the natural beauty of the brickwork, for its presence can not be detected on a wall. Hydrocide Colorless contains no paraffin; it does not run in hot weather; it penetrates the brick; it does not collect dust; and it can be painted. If you would have warm dry interiors no matter what the weather, use this perfect waterproofing material.



This bright cheerful interior above is the eighth floor of the Whitaker Paper Company's building at Baltimore, Md., which comprises the office, sales and display room. The interior is painted with Cemcoat. The concrete floor is smooth and hard—it has been treated with Lapidolith.

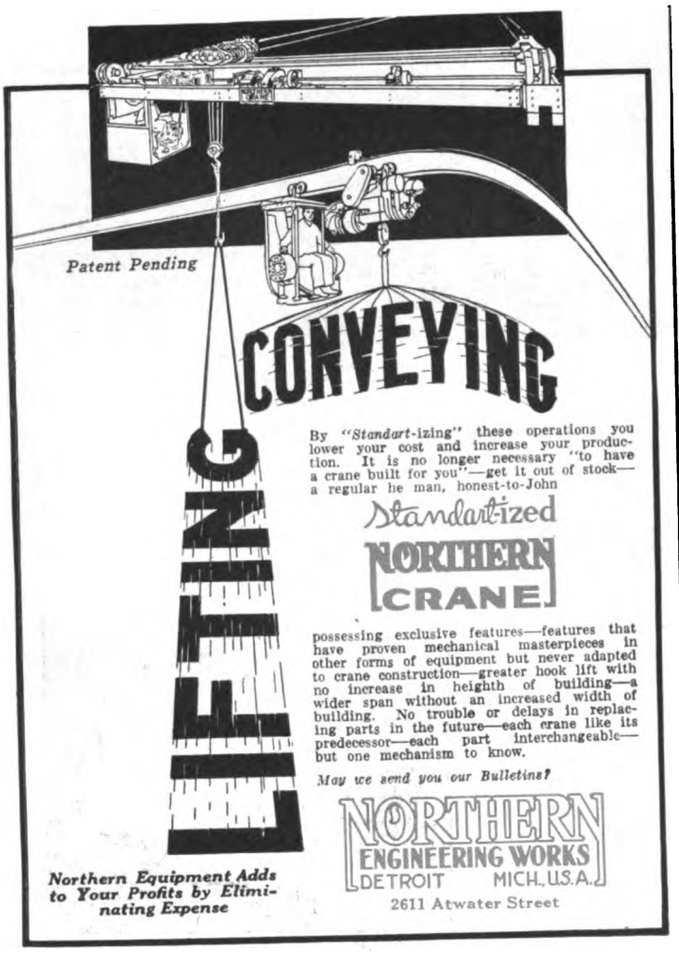
For years the leading industrial plants of this country—such plants as Ford Motors, Standard Oil, Bethlehem Steel, Swift & Company—have kept down their maintenance costs by using some or all of the above products. It will pay you to know more about these products. Sign the coupon below and return it to us today for complete information.

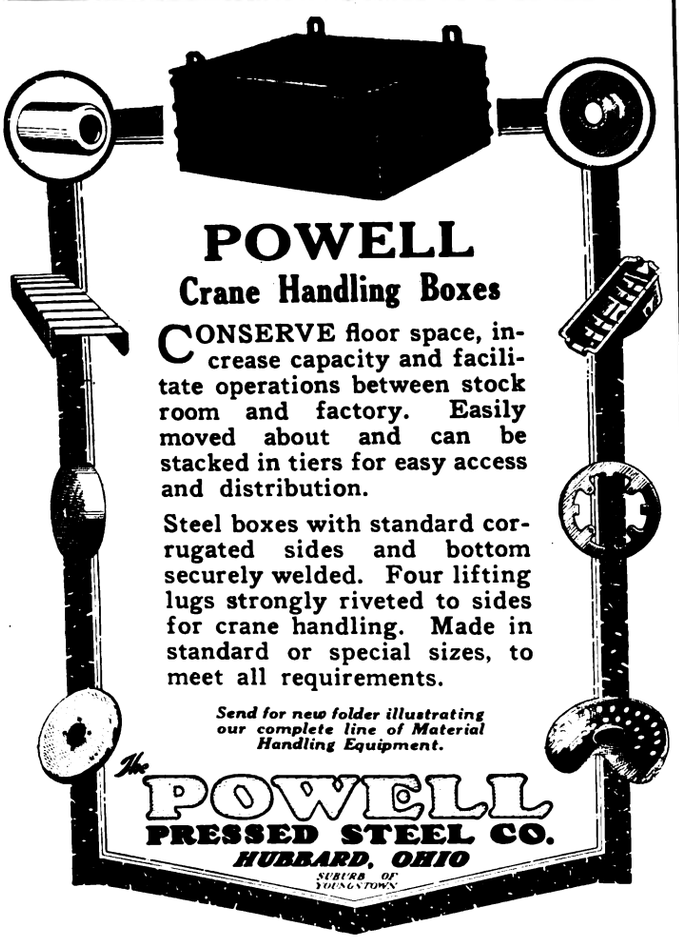
L. Sonneborn Sons, Inc.
114 Fifth Ave., New York City

Please send me, without any obligation, demonstration sample and literature on:—
Lapidolith...; Lignophol...; Cemcoat...; Hydrocide Colorless....; Stormtight.....
Check those products that interest you most.

Name.....
Mail Address.....
.....
Company.....
Position.....

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(*Continued from page* 68)

affected areas. Furthermore, essentials that were assured us during the war would have no definite assurance in this instance. Coal, as an example, would probably not be so generously parcelled out in 1927 as it was in 1917. The coal supply therefore would be of extreme importance.

Preparation and Maintenance of Plant

There appears also the necessity for setting the plant in order—of making thorough preparation for hard service to machinery and (where located in the north) adequate measures for the conservation of heat and power.

Too many manufacturers and building superintendents fail to recognize the large economies in fuel that may be effected through properly designed and maintained heating equipment. It is unfortunate that manufacturers in general pay so little attention to the loss of heat due to infiltration. Cold air leaking into a building on the windy side and warm air leaking out on the opposite side constitutes infiltration loss. Too often this loss is great. Very often it could be reduced by a little attention to building construction, the rearrangement of mains and radiation and the proper distribution of heat. Inexpensive attention paid to these items would result in the saving of large quantities of coal. The cold air coming into the average plant amounts to from one to three times the cubic contents of the room each hour, the amount depending largely upon the velocity of the wind. As all infiltrated air must be heated, a windy day imposes a great additional load on the boilers.

Many factories are improperly heated. Too much heat in some rooms, with a lack of heat in others, is a condition commonly found. Not only does this affect the consumption of coal but it materially affects the efficiency of the workers, the latter item being, perhaps, the more expensive. Taking into consideration the building construction, infiltration, exposure, insulation of mains, and other elements, heat losses can be calculated and steps taken toward correction.

Some Tips on Heating and Power Economy

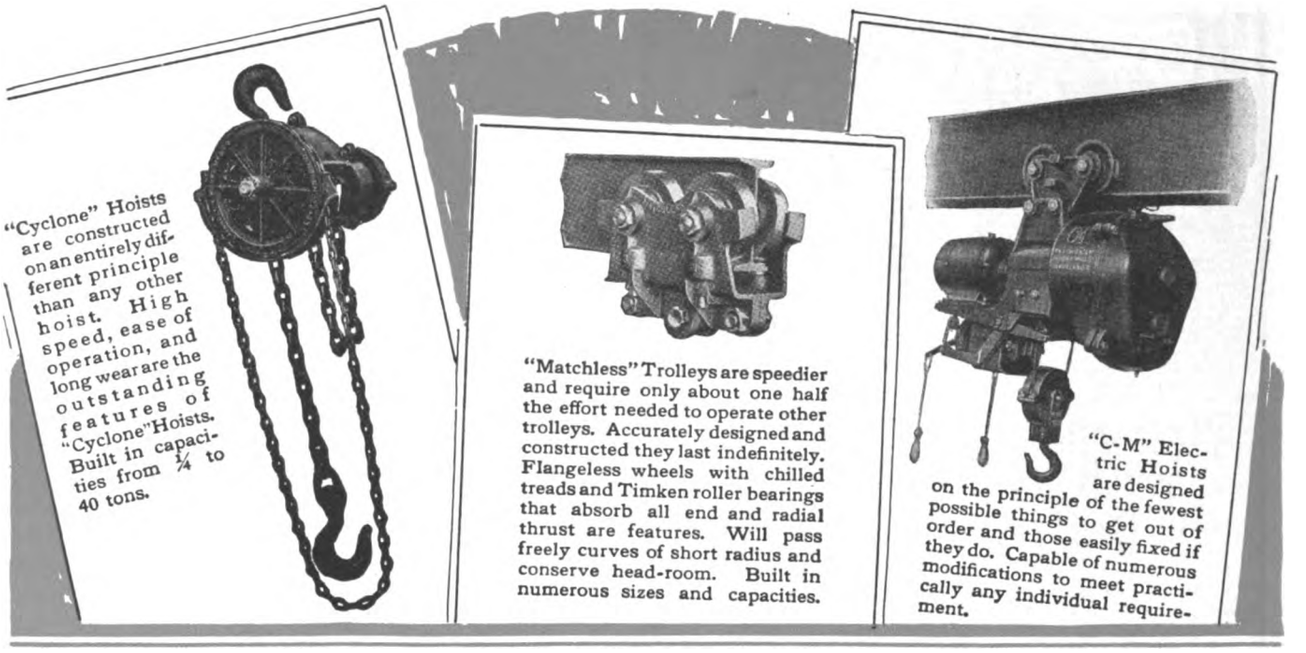
More and more metal sash is being employed in industrial construction. This sash, being of a durable nature, is frequently abused by slamming. This results in injury to the sash which injury must be straightened before the sash can be made to close tightly. Such sash can be caulked with a plastic cement (around the edges) if it is desired to make the sash air tight.

Heating engineers tells us that at least 2½" of space between the walls and the radiator are necessary to assure good results. In mills employing overhead belts as power transmission, the transmission of heat is increased slightly due to the air currents intensifying the velocity of air passing over the radiators. Automatic temperature controls very often effect a saving in heating fuel of from 40 to 50 per cent. When a boiler is shut down let it cool off slowly. Cooling a boiler too rapidly will cause fire brick trouble. The brick setting in a boiler should be absolutely tight and free from leaks of a high degree of boiler efficiency is to be maintained. A troweled layer of plastic cement on the outside of a boiler will do much to fill cracks and stop leaks.

Make one man responsible for heating efficiency.

(*Continued on page* 74)

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Ready for *YOUR* Material Handling Jobs!

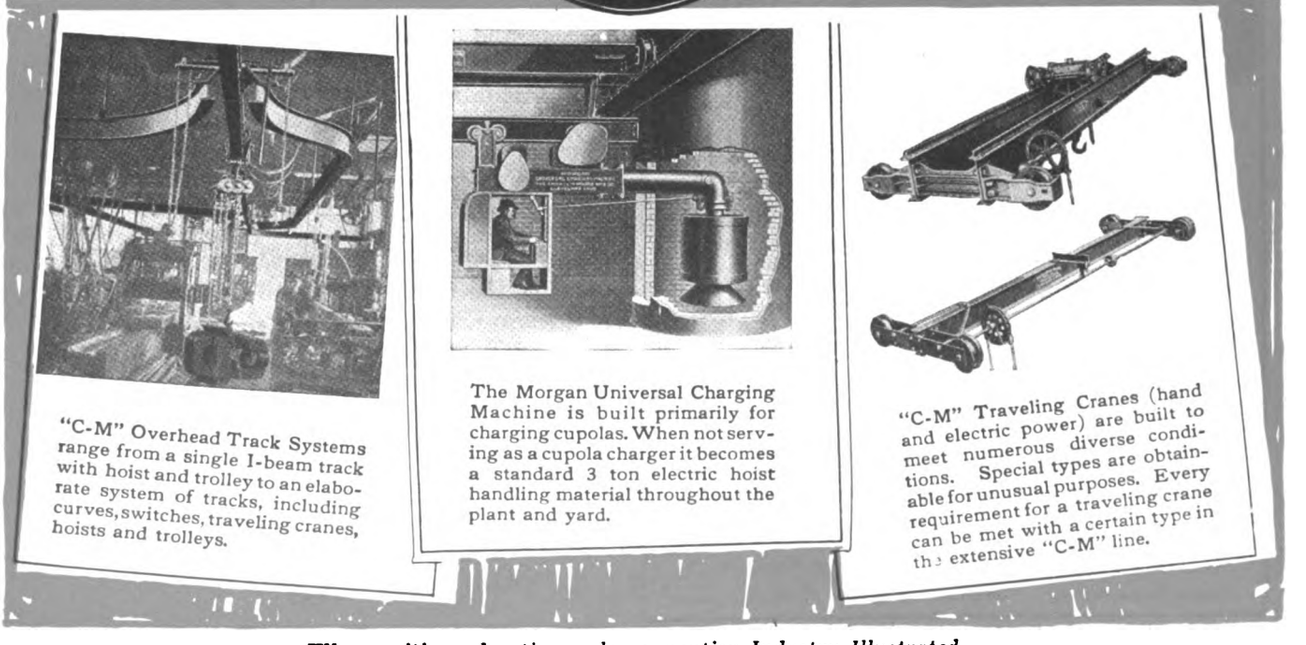
You **are interested in solving your material handling problems.** ***We*** **are interested in helping you solve them! We can cite numberless instances of where "C-M" equipment is speeding up material handling in** ***other*** **plants but we know you are interested primarily in** ***your*** **plant. Our sales engineers are specialists in survey work. Their experience enables them to co-operate with you in a thorough analysis of your material handling problems. Such surveys are entirely without obligation to you. Manufacturing a complete line of overhead material handling equipment, this organization is especially qualified to give you that co-operation obtainable** ***only from the manufacturer of a complete line.*** **We will be glad to send catalogs, bulletins, and complete information.**

THE CHISHOLM-MOORE MFG. CO., *Cleveland, Ohio*

***BRANCHES*—NEW YORK—CHICAGO—PITTSBURGH**

CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS



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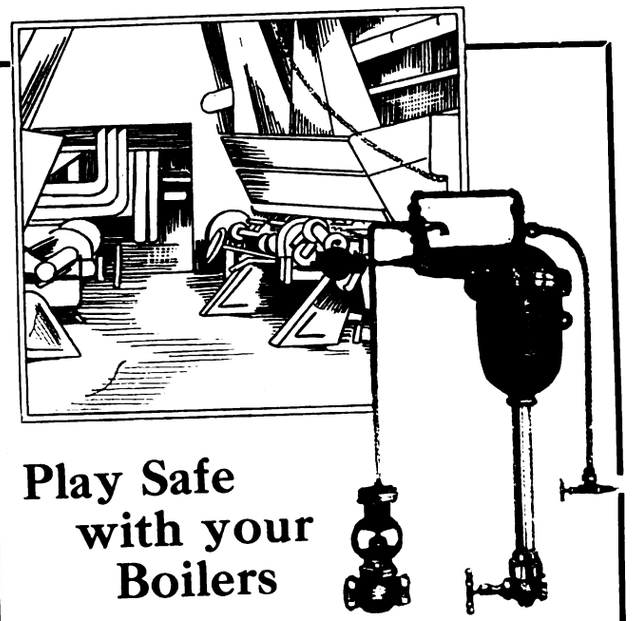
(*Continued from page 72*)

Dividing this responsibility results in buck-passing and wasted coal. Predetermined building temperatures are not always correct. Humidity is a key factor in workmen efficiency. Seventy degrees will be too cool for comfort when the humidity is low. With high humidity, 68° will probably be too warm. Common sense must enter into the distribution of heat. Leaking radiator valves are costly in coal. Pipe coils should be lined to avoid sagging and consequent water pockets. Steam traps are supposed to remove condensation without wasting steam. Poorly operating traps waste a great deal of fuel. Some of the larger companies such as Swift's, Ford Motor Company assembly plants, etc., have provided themselves with dual feed systems. Though they may use coal principally, they also have oil burners and an oil burning system installed and ready for operation. This foresight frees them from dependence upon one kind of fuel for heat and power.

Silent chain as power transmission has been known to increase production of machines up to twenty per cent. Steel shelving for storage not only reduces fire hazard and insurance rates but increases storage capacity up to 15 per cent. over wooden shelving. Power trucks and trailers in plant transportation range from 50 to 800 per cent. more efficient than hand operated trucks. Ventilating systems remove all lint, dust and bacteria, and their maintenance is very low. White interior paint saves its cost in a reduction of lighting expense and adds to the efficiency of employees. It can be applied with a paint spray gun with one-fourth less paint and in one-tenth the time and expense that is required with ordinary painters and four-inch brushes. A fan in the generating room draws off all surplus heat and allows the generator to operate with increased efficiency.

All of which is given only to cite a few of the numberless ways by which a plant can be brought to a higher standard of efficiency and a higher level of production. Such thoughts are but natural when seriously considering the production increases and the operation economies that would be necessary—"If Winter Comes." They apply, however, even in normal years.

A summerless year would be more disastrous to northern state industries than to those of the South. The latter are practically safe due to the advantage of geography. And indeed, there may come no such year. We hope not. We hope Professor Cox, not Mr. Browne, is right. However, meteorologists are like physicians—there is no telling which one is telling the truth. Remembering this and the advances made in the science of weather forecasting, however, it will harm nothing to accept, at least in principle, the conclusions of those who have made a life study of the subject. Certainly, there can be no harm in lifting the level of efficiency of power plants and factories through the adoption of sound, practical, every-day measures.



Play Safe with your Boilers

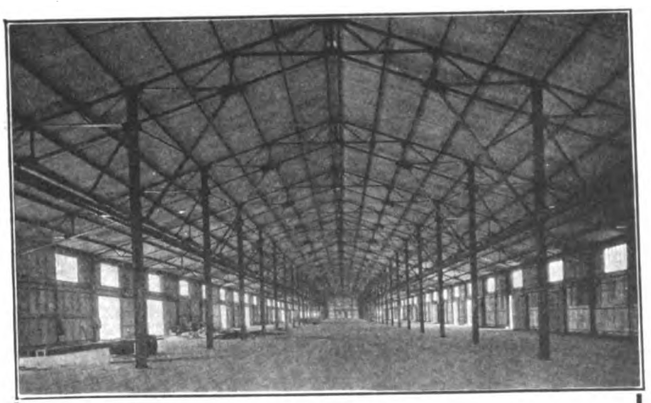
Don't take chances when costly equipment and human lives are involved.

Vigilant Feed Water Regulators control the proper water level of the boiler feed water. They are entirely independent of the human element.

Operated by gravity — there are no floats, tubes or diaphragms to get out of order. For real boiler and fuel economy Vigilant Regulators have no equal.

It will pay you to write and get full information.

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Milliken Buildings

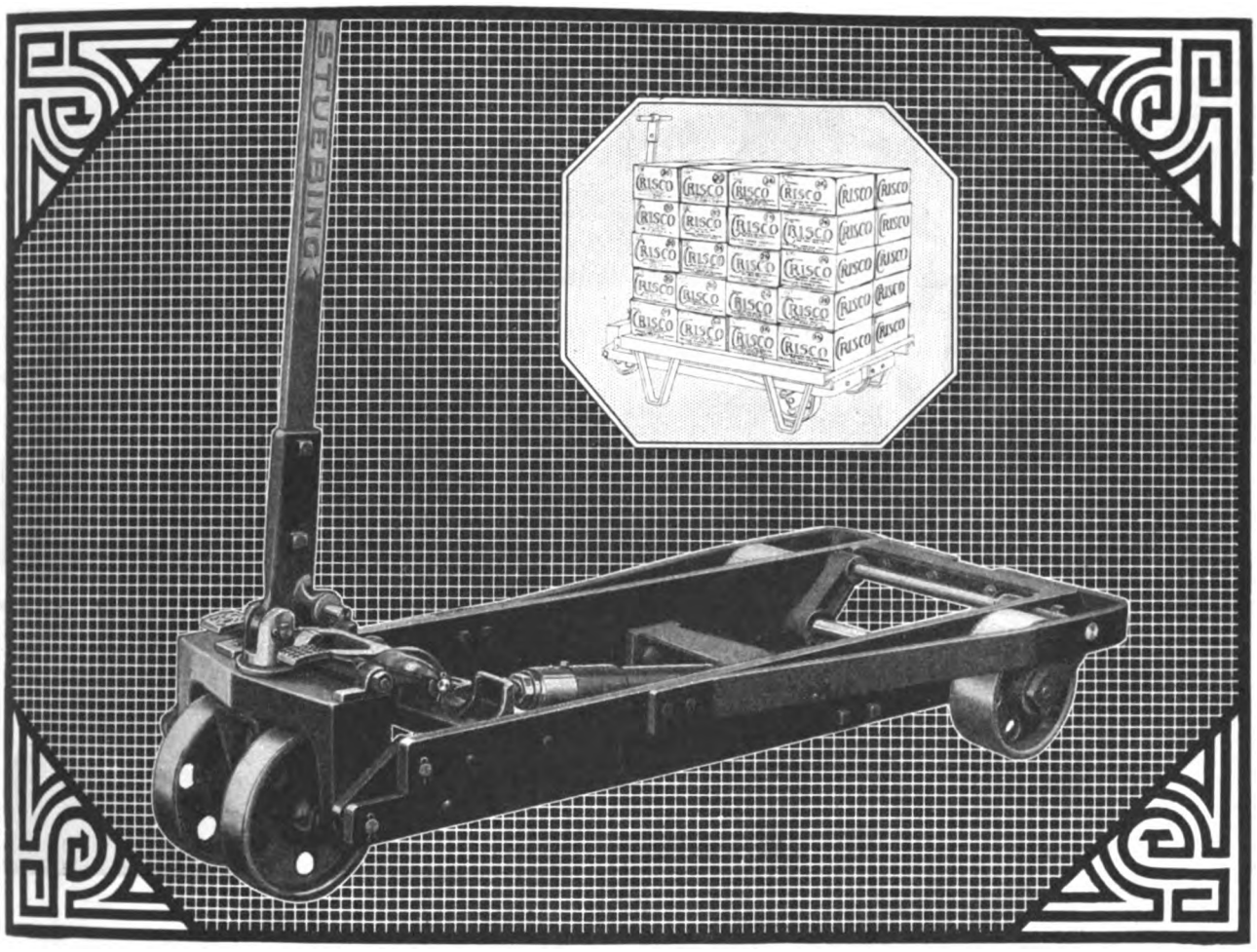
Investigate these buildings for your next plant structure. They are the best and most economical standardized steel buildings, formed of standard structural steel, complete in every detail. Every building is ALL-STEEL, PERMANENT and FIREPROOF, designed to last a life time.

Hundreds of these buildings have been constructed in all parts of the world. There is a size to suit exact requirements, whether for shop, warehouse, industrial plant, garage or other service. The material is stocked, ready for immediate shipment, erection with local labor.

Our engineering department is at your service. Complete Illustrated Catalog mailed anywhere on request.

MILLIKEN BROTHERS MFG. CO., INC.
2392 Woolworth Building - New York, N. Y.
Established 1857
Transmission Towers *Milliken Buildings* *Radio Towers*

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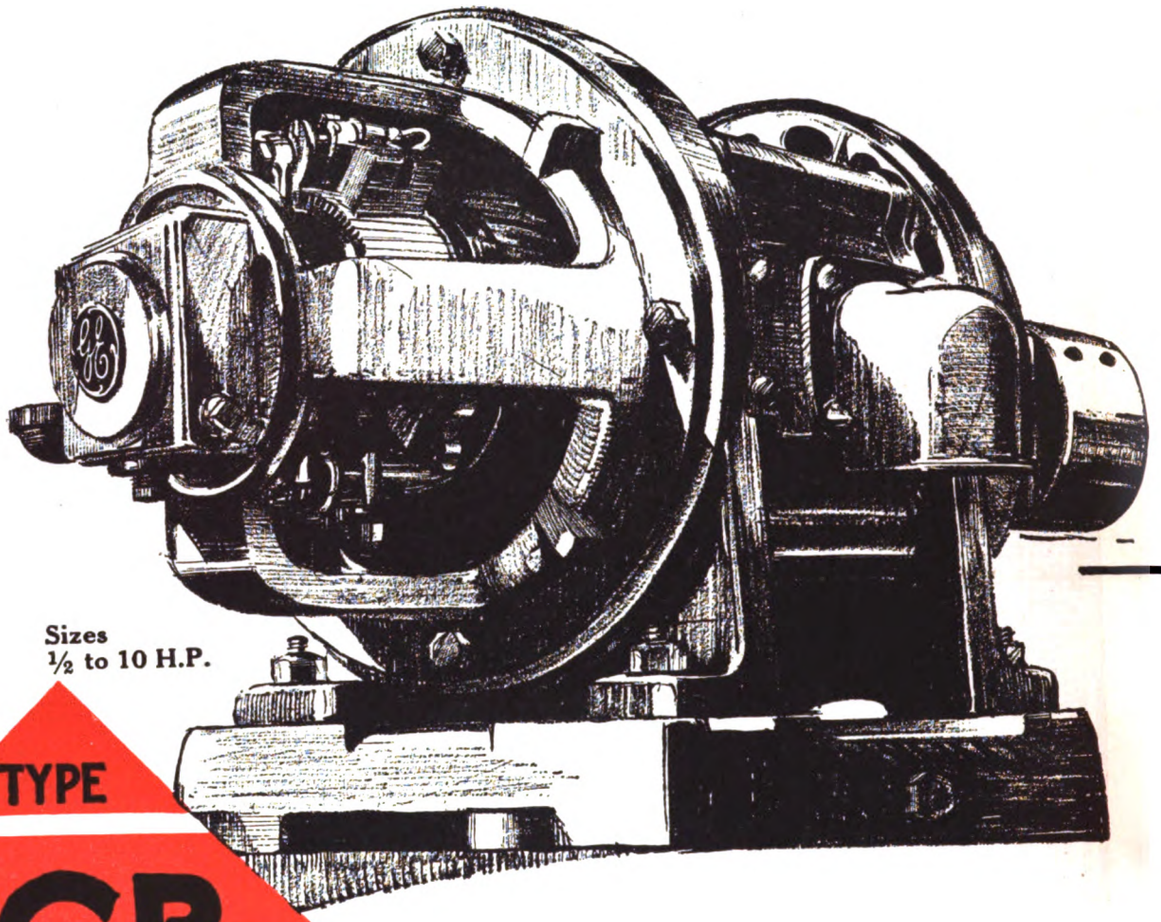


Get this powerful lift truck and raise your hauling to the right level

American business knows what cost sheets prove—Stuebing Lift Trucks pay their way and return big profits to owners. Lifting power and earning power have singled out Stuebing as standard equipment for many of the nation's largest users of inside transportation. Strong leadership based on a complete line, ranging from the sturdy Single Lift to the new Super Multiple Lift which enables one man to walk off with 5,000 pounds. All units are built by precision methods and are team mates of Stuebing Steel Bound Platforms, virtually indestructible and quickly adaptable to every kind of load. Send for catalogue and list of big users in your line. The Stuebing Truck Company, Cincinnati, Ohio; and Cornwall, Ontario. Branch sales offices in all principal cities.

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LIFT TRUCK SYSTEMS

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Sizes
½ to 10 H.P.

TYPE
SCR
MOTOR

Characteristics:

High Torque
—Start
—Acceleration
—"Pull Out"
High Efficiency
High Power Factor
Low Starting Current
Low Heating
Excellent Commutation
—Overload Capacity
—Speed Regulation
Quiet
—Starting
—Running
Positive operation
on low voltage

the Single Phase Motor with *reserve power*

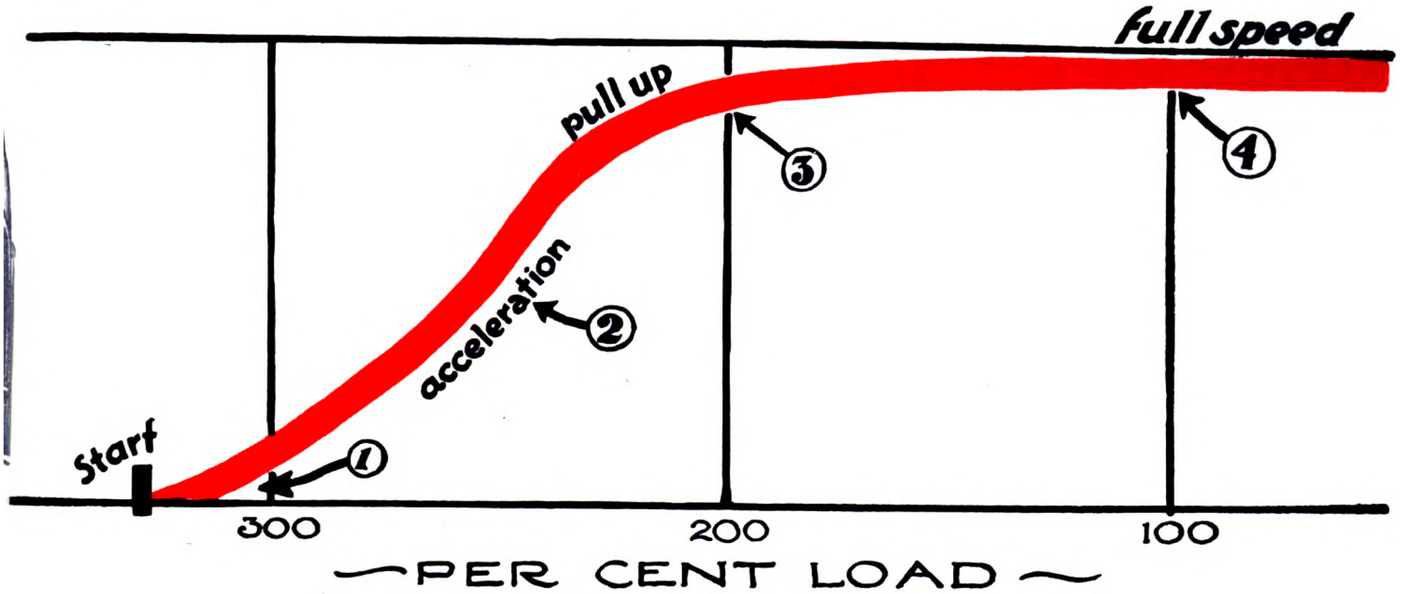
Most automobiles on smooth roads, once up to speed, pull the load. The "real car" negotiates the big hills or heavy roads "on high."

The type SCR motor has the same *reserve power*, first to start then to accelerate the load up to full speed and finally to sustain that speed at overloads.

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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Smooth acceleration!

"Start" ..... An **SCR** in starting exerts a powerful twist or torque—3 times that required at full *speed*!

"Acceleration"... The **SCR** motor does not "*hang*" at any point while accelerating

"Pull up" ..... The **SCR** has a "pull up" torque twice that at full load

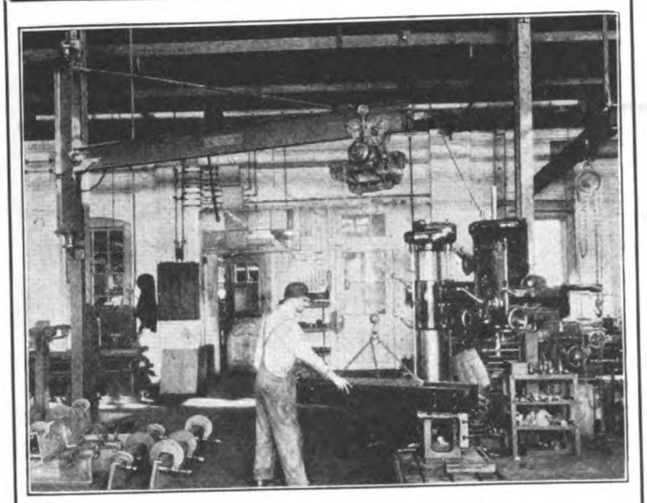
"Overload" ..... The **SCR** motor will sustain a heavy momentary overload without unduly slowing down

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MULTIPLY MAN-POWER
WITH
ROEPER ELECTRIC HOISTS

Keep the machines active so they produce the utmost.

The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

Ask for full information.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys



MEECO COOLERS—
A Real Economy

Meeco Coolers save time and money by preventing the hot weather slump in efficiency. They use less ice per man per season than other types because the tank and coil capacity is scientifically designed to supply a greater number of men on each charge of ice.

One Meeco Cooler will supply 100 men in constant average use. No time lost waiting for water to cool.

Meeco Coolers give year-round service by draining the tank and utilizing the cooler as a regular drinking fountain. There are many other features.

Fig. 613

Write today for prices and complete information

Lockers
Sanitary Washbowls
METAL MEECO PRODUCTS
Shelving
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Partitions

MFG. EQUIPMENT & ENGINEERING CO.
Originators and World's Largest Makers of Ice-Cooled Drinking Fountains
FRAMINGHAM, MASS.

Painting for Protection

(*Continued from page 27*)

seen the disastrous effect of the river gases upon all colors and kinds of paints used on the houses and about industrial plants. Grays would turn black; whites change to varied shades of grays; browns go over to a purplish tint; yellows quickly become pink; and in fact all colors of the rainbow were represented. This change in color and consequent deterioration of the paint coat was directly traceable to the action upon the lead content of these paints by the gases arising from the river water. These fumes changed the lead carbonate to lead sulphide, at the same time causing excessive chalking and early destruction of the protective value of the paint coat. Since that time considerable success has been achieved by paint makers in the perfection of "gas-proof" paints. Tests conducted in gas-ridden areas have shown these products to be extremely resistant to the action of the gases and able to retain their color and their protective qualities a relatively long period of time. The most successful of these products are composed of varying percentages of lithopone and zinc oxide, with certain inert materials necessary to hold these two pigments together. They can be furnished in all desired shades and are really the only satisfactory type of finish to use under such adverse conditions. Industrial plants having to combat similar conditions may find the answer to this problem in the adoption of "gas-proof" paints, most manufacturers being in a position to furnish them.

All shingled surfaces should be painted for the sake of their protection. An unpainted shingle roof is a fire hazard. The surface becomes "fuzzy," warped and cracked, affording a ready lodgment for cinders, burning brands, etc. All paint and shingle stain is more or less "fire-retardant." Innumerable tests show that a painted or stained roof offers considerably more resistance to accidental ignition than a surface unprotected by paint or stain. In industrial plants, therefore, where shingle roofs are used, be sure to have them painted, if for no other reason than that mentioned above.

Composition roofs, slag roofs and others of like nature are frequently used on industrial plants. There is a time in their life when they become well worn, porous and unsatisfactory. At such a time the application of one of the heavy, black, red or green plastic coatings serves a distinct purpose. This material is of a very heavy consistency, and its content of asbestos fibre serves to hold the ingredients together, as well as to offer resistance to fire. These applications are as a rule very satisfactory and add many years to the life of the roof.

The enormous amount of metal used in and about industrial plants should necessitate greater care and more consideration for their life and protection than is usually given them. Unprotected metal surfaces are an indirect cause of high overhead and expensive plant upkeep. The yearly replacement bill for uncared-for and destroyed metal surfaces reaches a staggering sum. As long as there is an unbroken film of paint or varnish between the metal and the forces of destruction there is no danger. But let that film become damaged or removed, and trouble begins. These surfaces are not only subject to the action of dust, dirt, smoke, soot, gases, fumes, etc., but to the uneven stresses and strains caused by changes in temperature with consequent expansion and contrac-

(*Continued on page 80*)

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A Baker Tractor can haul a 20-ton train of trailers or shove a machine tool into place.



This Baker Hy-Lift Truck is invaluable for carrying and stacking heavy materials, and placing dies in punch presses or similar work.



Here, there and everywhere in continual demand; that's the daily record of a Baker Utility Truck.

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.

Baker

Material-Handling Facts

THE average Baker installation saves its entire first cost in the first six months—all further saving is pure profit.

¶ Each Baker machine frees from six to fifteen men for productive, profit-making work.

¶ One man and a Baker Tractor, for example, can handle in one trip 40 hand-truckloads at triple the speed between departments.

¶ One man and a Baker Elevating Truck can "feed" a roomful of machines and remove all finished work, saving two or more handling operations on each load.

¶ One man and a Baker Utility Truck can handle all the heavy work in a light manufacturing plant and be in continual demand from morning till night.

¶ 60% of all Baker sales go to concerns which have proved these facts by personal experience with Baker equipment.

¶ A special report on electric material-handling as applied to your plant gladly made by an experienced engineer on request.

Baker Industrial Division
THE BAKER R & L COMPANY
CLEVELAND

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.

Baker



Baker Locomotive Cranes—with all four motions electrically driven — are mighty useful where heavy materials must be moved.



For bulk loads—coal, ashes, etc.—Baker Dump Trucks, with their 27 or 40 cu. ft. of body capacity, are big time-savers.



The breadth of usefulness of Baker Elevating Trucks hasn't yet been determined—new applications are discovered every month.

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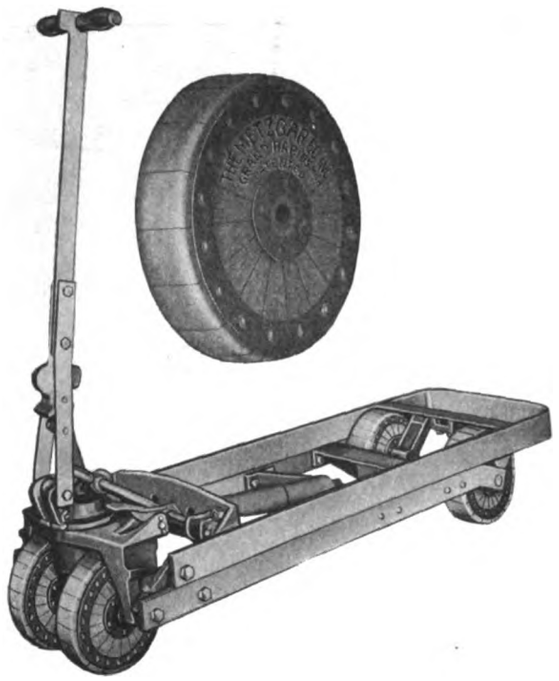
(*Continued from page 78*)

tion of the metal. An efficient paint coat must therefore be elastic and not be adversely affected by these factors. When a metal surface begins to show rusting or the presence of corrosion, then is the time, in fact it should be the *latest* time to give it paint protection anew. The better plan is to see that the paint coat is renewed *before* the rusting begins. For it is a difficult matter to make sure that all rust and corrosion is removed before repainting. And unless this is done, the benefits to be gained from the new coat of paint will be greatly lessened.

Another important point is the effect that relatively high degrees of heat have upon the life of a paint coat. Stacks, kilns, boilers and such surfaces are difficult to keep painted any great length of time, due to the fact that very few paints will withstand the action of high temperatures. The writer just checked up on a heat-resisting test of a number of blacks, all of which were supposed to be resistant to a relative degree to high temperatures. It was found that after passing a temperature of 550° F., that practically none of these blacks offered any resistance, but literally burned up. A number of the finishes showed fairly good results up to that point. The most efficient black was one composed of gilsonite asphaltum mineral spirits and treated oils. This product retained its life, toughness and protective qualities in an unusually efficient degree. An interesting development in these heat tests was the effect of high temperatures upon coal tar blacks. These blacks are frequently used on surfaces to resist relatively high degrees of heat and they are efficient for that purpose up to a certain point. But when subject to temperatures of about 650° or higher, they burn up, leaving as a residue a finely-powdered dust of a pinkish cast. This seems to be an ashy residue of the burning process. Of course, it does not possess any merit from the protection or preservation standpoint.

In many industrial plants, in addition to the normal exposure of metal surfaces to atmospheric conditions, as well as to heat, fumes, gases, etc., there is still another factor to consider, and a very important one. This is particularly true in power plants or in industries using electricity and conveying the current under high voltage. It is generally admitted that escaping electric currents have a serious effect upon the resistance of metal surfaces to corrosion. Electrolysis,—a term used to define the detrimental effects upon metal surfaces of the action of these currents,—is set up between the pure and impure sections of the surface, with the result that whatever rust and corrosion there may be present is greatly stimulated and increased. Under such conditions it is doubly important that the protective film of paint is kept intact and not permitted to be broken, thus giving "Old Man Rust" a chance to get in his nasty work.

In conclusion, while the proper use of paint and varnish in the maintenance of industrial property has its importance from the appearance standpoint, its main function is to prevent costly replacement of wood, metal or other surfaces, to lengthen the life of the structures now erected and to keep down repairs to a minimum. To do this requires a very careful selection of the paint or varnish products, from the standpoint of the suitability of each for the work to be done.



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METZGAR WHEELS

The Barrett Lift Truck is noted for its sturdiness and long life. Metzgar wheels are being specified by the Barrett-Cravens Company after exhaustive tests with a firm and positive conviction that these wheels will add to the present high efficiency of these trucks.

Metzgar wheels are built to stand up and we stand back of them. They roll easy, last long, are silent in operation, require little, if any lubrication, will not break and will not injure floors.

Always specify Metzgar wheels for any and all new truck equipment and for all replacements.

We make them to suit your requirements.

Write for full particulars

METZGAR COMPANY, Inc.
GRAND RAPIDS ~ MICHIGAN, U.S.A.

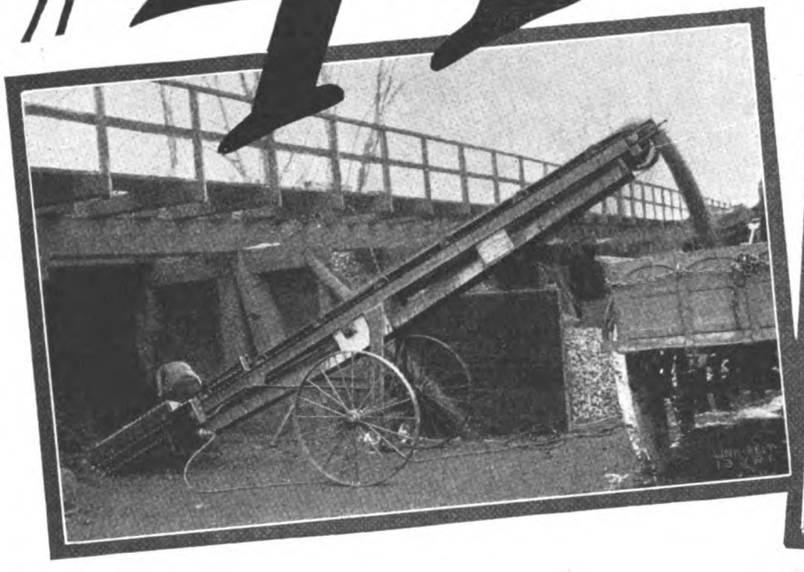
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End-Grain Wood
WHEELS

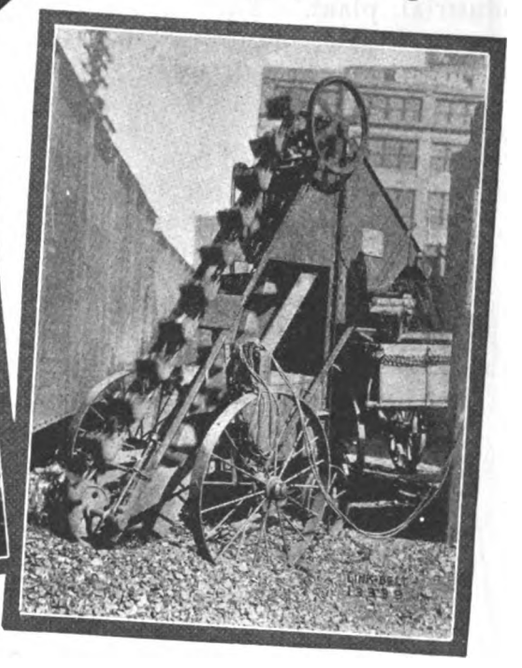
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F. O. B. Philadelphia or Chicago.





The Biggest Portable Loader Value Link-Belt Ever Offered

The "Cub" Portable Belt Conveyor

THIS sturdy and compact machine will load your material faster than six men—from the ground to wagons, trucks and cars. Efficient, convenient, low in first as well as operating cost—you cannot afford to load any material without it.

Equipped with 2-H. P., two or three phase, 60 cycle motor; 21 ft. conveyor length; 18" wide belt, assuring large capacity. Belt is guaranteed against cutting or fraying. Wide loading hopper at foot of conveyor is hinged—easily and quickly opened. Loads 45 cu. ft. of material per minute. Use the coupon.

Type "C" Portable Bucket Loader

QUANTITY production enables us to sell this substantial, all steel machine—a most durable and very rigid unit—at this unusually low price. For uniformly steady operation—efficiency—and convenience—it is unequaled.

Equipped with 2-H. P., two or three phase, 60 cycle motor; 12" x 6" malleable iron buckets mounted on Ewart Link-Belt; interchangeable and easily adjustable gravity screens; screening chute, dust hopper and dust chute—independent units, easily replaced. Discharge height, 7 ft. 2 in. Use the coupon.

LINK-BELT COMPANY, 2045 HUNTING PARK AVE., PHILADELPHIA, OR 300 W. PERSHING ROAD, CHICAGO (ADDRESS NEAREST OFFICE)

Please send me full particulars about your_____ Portable Loader. Industry Illustrated

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THIS YEAR 50 LINK-BELT IS FIFTY YEARS OLD

Famous Portable Loaders

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TRUSCON
ALLOY STEEL
BOXES AND PLATFORMS

Truscon Alloy Steel Boxes and Platforms facilitate handling and storage in every sort of industrial plant. They are staunchly built from steel plates and pressed into rib formation to secure greatest strength. Truscon Steel Boxes are further protected by a double-turned flange around the upper edge. Truscon Steel Platforms are designed especially for lift-truck handling and Truscon Steel Boxes may be had for attachment to Platforms where it is desired. Truscon Boxes may also be provided with lugs or trunnions for crane handling when such equipment is wanted. Whatever your handling or storage preblems let Truscon experts cooperate with you. This service is without obligation to you.

Return coupon for further information

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO

Special Box and Platform Representatives in New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Buffalo, Detroit, Boston, St. Louis and Cincinnati.

Truscon Steel Boxes for crane handling are equipped with lugs which also act as guides in stacking. These Boxes may also be specially reinforced for high stacking range.



Other Truscon Steel Products are: Steel Windows of every type, Standard Steel Buildings, Metal Lath, Steel Joists, Steel Doors, Steel Lintels, Steel Inserts, Steel Columns, Steel Poles, Foundry Flasks, and Reinforcing Steel for every purpose.

TRUSCON STEEL COMPANY,
Youngstown, Ohio.

Send me full information on Truscon Steel Boxes and Platforms.

Name .....

Address ..... I.I. 4-25

Keeping Tabs on Small Tools and Equipment

(*Continued from page* 21)

Small tools and equipment are of an importance far in excess of their relative purchase prices, as compared with heavy equipment. Take, for example, the large battery of drilling machines represented in our center picture on page 2. The investment in these tools in this department (it extends beyond the confines of our picture) exceeds thirty or forty thousand dollars. The wages of the operators of these batteries of drilling machines amount to thousands of dollars per year. Compared with this big investment in machinery and labor the small tool equipment, the drills and reamers for these drilling machines—are insignificant in cost. Yet the performance of the big equipment and the performance of the labor operating it is dependent on these small tools. How ridiculous it is, therefore, when you come to think of it, to exercise the false economy of choosing and using anything but the best!



Fig. 6. Here is an example of poor shop-housekeeping. The man who runs a shop of this kind does not deserve to make a profit. It's a safe guess that he neglects his small tools and equipment shamefully.

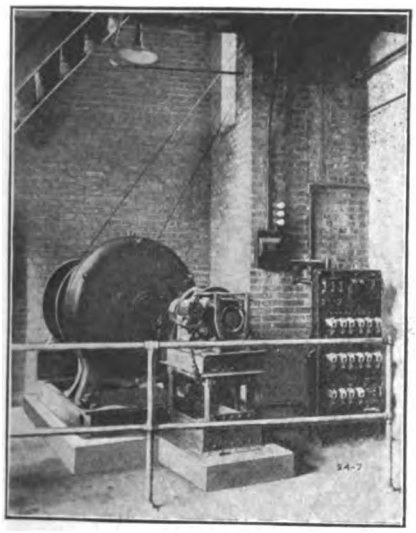
Keeping tabs on the drills and reamers is not a difficult task if it is gone about right. It is almost as important to know the number of holes produced during the life of a drill or reamer as it is to know the daily output of each operator. Records of this kind are easy to obtain and will give the cost department something to do. Instead of leaving the matter to individual judgment, such records provide a scientific guide to the proper selection of tools for various kinds and classes of work. The record may be enlarged to include the number of holes between successive grindings. From the standpoint of operation, this is an important item, because each time that a tool becomes dull and must be changed, man and machine time, alike, are lost and can never be regained.

If you use many small tools, of course you have a tool checking system in your plant. Not only does this prevent theft and loss by making the operator responsible for the company's tools in his possession, but it also gives opportunity for a systematic checking up on tool condition. Many small tools are ruined, not by use but by

(*Continued on page* 84)

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The Gap Between Cost and Price



Hunt Gear Case Hoist, for operating Skip Hoist, with motor operated brake and control panel for full automatic and semi-automatic operation of skip.

Installed in the Gas Plant of the Philadelphia Suburban Co., Chester, Pa.

The entire concrete structure housing the skip hoist was designed and built by the C. W. Hunt Co., Inc.

WE DESIGN AND BUILD

Industrial Railways, Automatic Railways, Cable Railways, Cars, Tracks, Switches, Motor Cars, Scales, Conveyors, Skip Hoists, Electric Vibrating Screens, Cut-Off Valves or Gates, Weighing and Measuring Devices, Coal Crackers, "Stevedore" Transmission Rope and Hoisting Rope.

"So vital a thing as keeping the cost and the price as widely separated as possible, would seem to call for the best thoughts of the most expert business executives."

"But it hasn't!"

From "Efficient Cost Keeping," by St. Elmo Lewis.

So many factors are involved in the cost of producing any commodity, that few executives trouble themselves to ascertain positive information bearing on the relation of certain operations to the cost of manufacturing the entire product.

Time is money, material is money, equipment is money. All of these units must be duly proportioned in the summing up of the cost of producing an article. None can be slighted in any degree, if a correct basis on which to build a selling price is to be obtained.

In handling coal, ashes and similar bulk material, the three elements of time, material and equipment play a prominent part; the most important of the three being *equipment.*

Good materials handling equipment, chosen with a knowledge of its intended use, will save both time and material,—consequently money, which in turn will lessen the production cost and increase profit.

Over half a century ago, Hunt Cost-Cutting Equipment was conceived and built with the object of saving time by conveying bulk materials rapidly; saving material from loss by spillage by smooth, even movement, and saving money by extraordinary length of service, with few repairs, thus forming ideal equipment for handling coal, ashes, and other bulk materials.

See that your materials handling system is the best you can procure. Hunt Engineers, with their over half a century experience in the designing and building of successful handling systems, will gladly assist you.

Write, phone or wire,—the response will be immediate

C. W. HUNT COMPANY, Inc.

West New Brighton, New York City

PHILLIPS, LANG & CO., Inc., 431 South Dearborn St., Chicago, Ill.

ENGINEERING EQUIPMENT CO., Ltd., 358 Beaver Hall Square, Montreal

ERNEST F. LEARNED, 141 Milk Street, Boston 9, Mass.

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Paint's relation to profits

PAINT has a lot to do with slowed down production schedules and the high cost of operation. *Re*-painting is what costs—removing one coat of paint and applying another, with all the delays and expense involved.

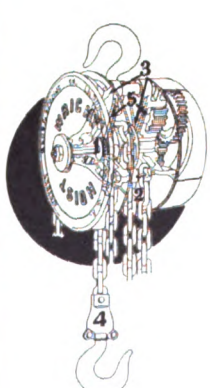
Nitrose saves the biggest part of that. Nitrose is a glossy black paint with an astonishingly long life. It stands extremes of heat and cold, resists the action of the elements and the action of acids and fumes. Let us send a thoroughly trained paint engineer to you—perhaps he can point out big savings for you.

The Nitrose Company
Peoria Life Bldg.
Peoria, Ill.

CONQUERS CORROSION
NITROSE

I I-4-RTG

TO HOIST WRIGHT



You need the most modern in chain hoist equipment. Why use any other than the most modern? They run easier—last longer—are safer—more flexible in use—cost no more—etc. There is a type specifically for the use you have in mind.

May we send you our catalog?

WRIGHT MANUFACTURING COMPANY
LISBON, OHIO

(*Continued from page* 82)

abuse. Periodical check-ups on the condition of drills, reamers, taps and dies, help to reduce the number of rejects and lighten the work of inspection. All of this saves money.

Elsewhere in this article we show a tool spoilage report which has proven useful in this connection. Whenever a tool is broken, damaged or worn out, before the operator can secure a new one from the tool room he must fill out one of these slips and state the reason on it.

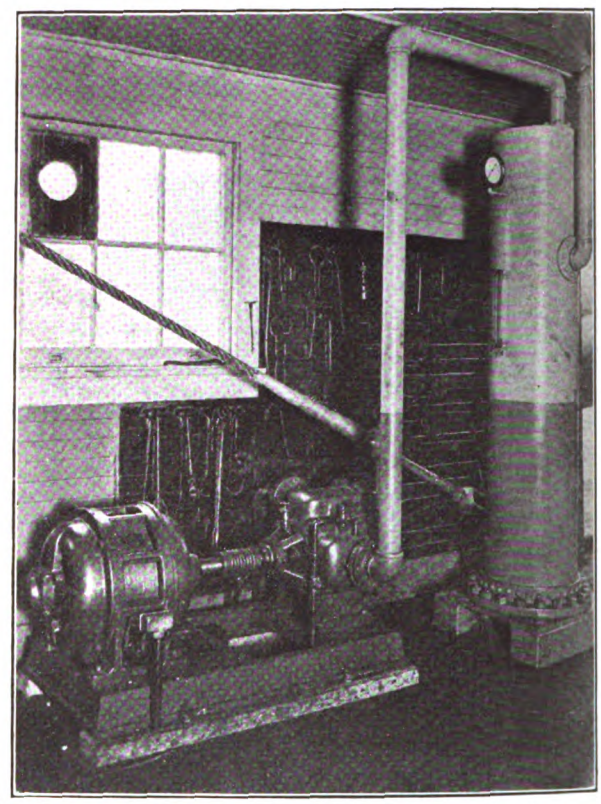


Fig. 7. "A place for everything, and everything in its place." That is the motto of the engineer who sends us this picture. His wrench board shows just where each tool belongs because its shape is painted on the board.

Just as the drilling machines in our center picture on page 21 depend upon twist drills and reamers for their output, so also do they depend upon their driving belts. In many factories, insufficient attention is given not only to the selection of belts but also to their upkeep. A chain is no stronger than its weakest link and no machine tool, however powerful and modern, can exert more

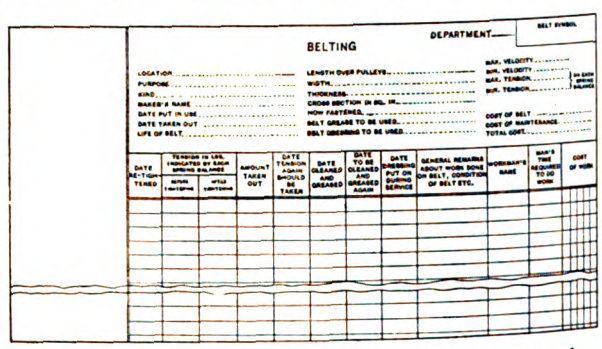


Fig. 8. A belt record and inventory will tell you exactly what each belt in the plant is doing and which one is costing too much for upkeep. It is a valuable guide to choosing the right belt next time.

(*Continued on page* 88)

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$100.00 in gold



$100.00 in Gold

$100.00 IN GOLD—five double eagles—will be paid for the best advertising slogan accompanied by the best explanatory letter, for the blue printing industry. Florists advertise: "Say it with Flowers!" Paint manufacturers proclaim: "Save the Surface and You Save All!" Think of the winning slogan, accompany same with your explanatory letter and get $100.00 for your idea.

Blue printing is the quickest, cheapest and most satisfactory method of reproducing all kinds of drawings. Thousands of businesses and industries know this and are saving money by using blue prints. But thousands of other firms are using blue prints only occasionally or not at all.

The slogan that wins the $100.00 in gold should be directed particularly at this class—it should be something more than a fine sounding phrase. It should be based on the fact that blue printing not only saves money but MAKES money for users. Therefore, each slogan must be accompanied by a letter telling why the idea is considered worth $100.00. These letters might be convincing sales talks, stories of how certain firms have used blue prints to advantage for drawings as well as for statistical matter.

If the letter accompanying your slogan contains very definite facts and arguments favoring the more general use of blue prints, it will help the judges to pick it as the winning idea. Many slogans and letters, which although good, do not win the $100.00, should contain valuable sales hints for the blue printing industry and all non-winners that can be used will be paid for at the rate of $5.00 each.

Conditions

1. A prize of $100.00 in gold will be paid to the person submitting the slogan best adapted for promoting the use of blue prints accompanied by the best explanatory letter.
2. Each slogan submitted must be accompanied by a letter containing from 100 to 500 words, stating why that particular slogan is suggested. One of the best reasons for a slogan is that it is based upon the actual experience of a company that has made profitable use of blue prints.
3. The Judges whose decisions will be final, will be
   (*a*) P. M. Morgan, Chairman of the Board, The C. F. Pease Co., Chicago.
   (*b*) R. C. Fenner, Business Analyst, Chicago.
   (*c*) C. L. Benjamin, Advertising Agent, Chicago.
4. In case more than one person submits the winning slogan, the prize of $100.00 will be given to the one with the best explanatory letter. All slogans and letters become the property of The C. F. Pease Company. No slogans or letters will be returned.
5. Slogans and letters (not prize winners) that can be used for promoting the use of blue prints will be paid for at the rate of $5.00 each.
6. Any one is eligible to compete except employees and families of the C. F. Pease Company. Contestants may submit as many slogans as they desire.
7. The contest closes June 15, 1925, and only letters postmarked as mailed before midnight of that date will be considered.
8. Announcement of the winners will be made through the trade press as soon thereafter as the Judges can reach a decision. Watch our advertisements for the money-winning names.
9. In order to be strictly impartial, neither the Judges nor The C. F. Pease Company can answer any questions regarding the contest, except to furnish these printed conditions.
10. Letters should be written on only one side of the paper and should bear at the top the name and full address of the sender. Mail letters to Chairman, Blue Print Slogan Contest, The C. F. Pease Company, 815 N. Franklin St., Chicago.

$100.00 in Gold

(*Continued*)

As the largest manufacturer of blue printing machinery, The C. F. Pease Company has planned this educational campaign to show thousands of users how they can operate their blue printing equipments more profitably. It is also this company's desire to increase the quality of blue prints used because they know that better blue prints will benefit the user as well as the industry.

The C. F. Pease Company is seeking a slogan something like "Use More Blue Prints!" It should be an easily remembered phrase—either based on an experience that could be duplicated by other users or so pat that it leaves no opening for argument.

Men and women connected with the blue printing industry, or working with blue prints, can find good slogan material in their own experience. Advertising men, copy writers, etc., can easily find enthusiastic blue print users to give them tips. The $100.00 prize makes it worth while to take a little time.

Because blue prints are not used by so many people as flowers and paint, etc., the number of slogans submitted will probably be comparatively small. This greatly increases the chances of those that do compete. Don't figure your slogan worthless, it may win the $100.00—send it in.

The C. F. Pease Company 815 N. Franklin St., **Chicago, Ill.**

PEASE

BLUE PRINTING MACHINERY

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Are Your Costs Live News or Mere History?

Is your cost accounting constructive engineering, or mere bookkeeping?

Modern Industry Demands that Costs be Accurately Predetermined

G. CHARTER HARRISON'S

"Cost Accounting to Aid Production"

presents a definite, workable program for bringing costing into line with today's industrial thought and practice.

It thoroughly works out methods for including costs among the known production factors planned for ahead of the process; for bringing them under the same control and inerrant forecasting with which we now make provision for the elements of time, labor, machines and material—to be reshaped, if necessary, while there is yet time to turn loss into profit.

The methods advocated are illustrated by 32 tables and 22 folded inserts of diagrams—the most comprehensive set of charts ever incorporated in a book on cost accounting. These diagrams represent plans actually used by the author in leading manufacturing concerns.

Mr. Harrison's tested methods provide the executive with focussed statements which in a few figures show him where costs are varying from standards, and the causes underlying those variations. They reduce clerical work to a minimum. They provide for close cooperation between the planning, production and cost departments.

Since its first publication, in March, 1921, thousands of copies of the book have been sold. Many business schools and technical colleges have adopted it as a textbook. Executives and cost accountants in widely diversified industries have hailed it as a vast step in advance of the hardly 50%-efficient cost system of today.

Charmingly written; scientific without being dull; seriously in earnest in its endeavor to advance the profession of cost accounting by placing it on an engineering basis, and to assist in the upbuilding of industry by enabling it to use its costs to cut costs; intensely practical and full of new ideas and suggestions—Mr. Harrison's book is one that every responsible man in every industry or business can use with profit. It will help take the drudgery out of your cost figuring and the uncertainty out of your production factors. Its methods are equally adaptable to the cost and production problems of plants employing fifty, five hundred or five thousand men.

251 pages, 54 tables and diagrams; red cloth, price $5

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120 West 32nd Street, New York

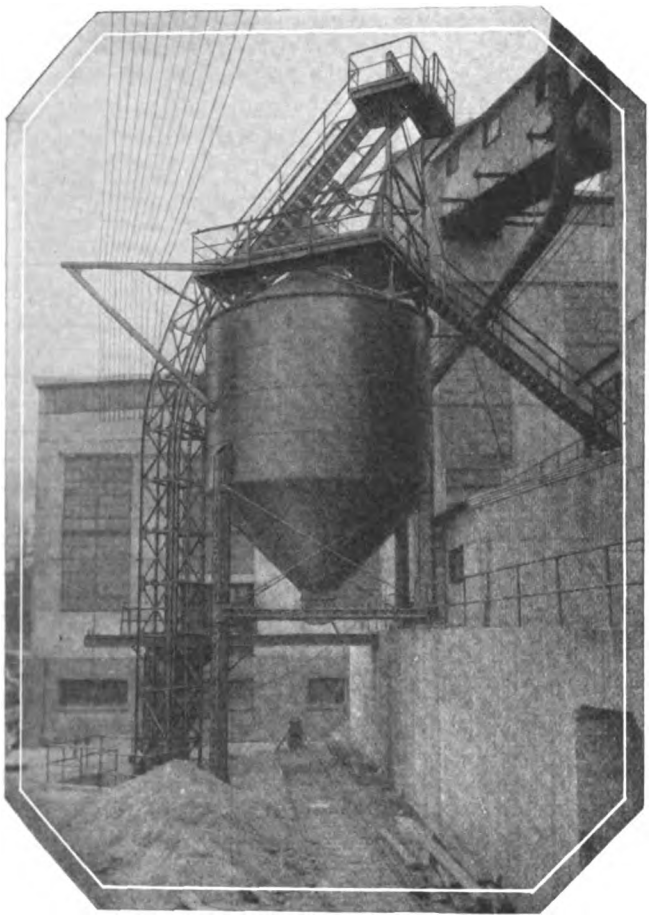
Send me one copy of "Cost Accounting to Aid Production" on approval. I shall either return it in 10 days or remit the price in 30 days.

Name..... *Street*..... *City*.....

State..... *Business connection*.....

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A SIMPLE AND ECONOMICAL MEANS *for Handling your Ashes*



The Webster ASH-SKIP HOIST

The Webster Ash Skip Hoist provides the most efficient means of handling hot or cold ashes in either large or small boiler houses. It also makes possible the handling of oversized clinkers without need of breaking them up.

After the ashes have been dumped into the skip bucket, they are carried up and dumped into an overhead storage bin from which they can be discharged into railroad cars. The skip bucket is hoisted up to the storage bin by an electrically driven hoisting unit which is automatically controlled from the boiler room by a push button control. Almost every human effort is thus avoided which secures desirable results and helps to keep the operating cost low.

Many Webster Ash Skip Hoists are now in use, handling ashes in simple manner at an ultimately low cost.

We design and manufacture skip hoists to suit the capacity and operating conditions of any boiler house and to fulfill every ash handling requirement.

THE WEBSTER MFG. COMPANY
4500-4560 Cortland Street
Chicago

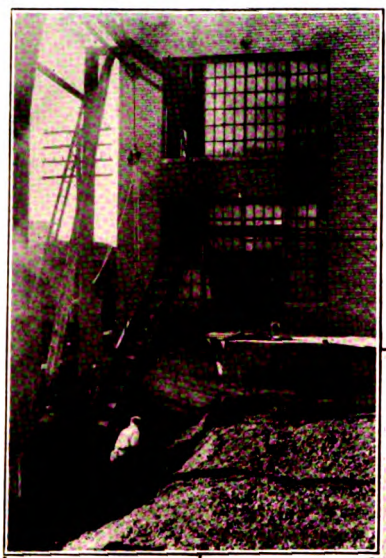
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WEBSTER

COAL AND ASHES HANDLING EQUIPMENT

Track Hoppers and Feeders
Coal Crushers
Bucket Elevators
Flight Conveyors
Pivoted Bucket Carriers
Ash Skip Hoists
Weigh Larries
Belt Conveyors
Coal Bunkers and Gates
Stoker Spouts

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Drag Conveyor loading coal into boiler room.



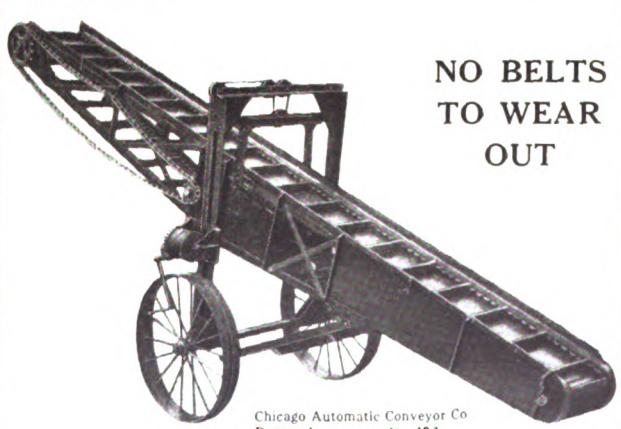
Conveyor on trolley unloading coal from car over wall into storage pile.

Simplify your Materials Handling

You will find Chicago Automatic Conveyors used on hundreds of handling tasks. Many applications, the above of which are a few examples, are shown in our illustrated catalog.

These conveyors are made in belt and bucket type and they will simplify your handling problems. Built all steel and last ten years or more.

Order one or more now and start saving labor costs.



NO BELTS TO WEAR OUT

Chicago Automatic Conveyor Co
Patented No 182

Chicago Automatic Conveyor Co.
982 Old Colony Bldg.
Chicago Ill.

(*Continued from page* 84)

power than the belt provides. Poor belts are an extremely bad buy at any price. For the first few days they may give satisfaction. Then they begin to stretch and slip and no amount of dressing or tightening will remedy the inherent drawbacks of a bad driving belt.

In this connection look at the belt record card which accompanies this article. It is not only a belt inventory but also a record of life cost, and by this is meant not merely the first cost but the cost during its lifetime. A belt having a very low first cost may have a very high life cost. In fact, the probabilities are that it will, because *quality* costs money to start with but comes out ahead at the finish.

Not only does this belt record give you the life cost of the belt but it will also tell the annual and monthly cost. The superintendent or cost department manager

A168 BM 6-12

PLEASE DELIVER THE FOLLOWING TOOLS TO NO. 310
BROKEN TOOLS MUST BE RETURNED

QUAN.	SIZE		QUAN.	SIZE		QUAN.	SIZE	
1	¾	DRILL			BOLT			OIL CAN
		REAMER			LB WASTE			
		TAP			WRENCH			
		MILLING CUTTER			CAUSE OF BREAKAGE OR REPLACEMENT			
		HACKSAW BLADE			DEFECTIVE JIG			
		FILE			DEFECTIVE MACHINE			
		CHISEL			DEFECTIVE TOOL			
		VIXEN FILE		X	CARELESSNESS			
		C" CLAMP			ACCIDENT			
		STRAP			FOREMAN F.C.Y.			

Fig. 9. Small tools do not cost much individually, but collectively they run into big money. It is well worth while to keep track of breakage or spoilage.

can run through the file of belt tickets and see at a glance which ones are eating their heads off, so to speak, in upkeep. Keeping tabs on belts is a sure way to save money.

Grinding wheels are so common in most metal cutting

F B STEARNS CO — OPERATION SYMBOL 10-8348

TOOL LIST FOR MACHINE No. 10 R 4 — DRAW No. 12500

TOOLS CALLED FOR ON THIS TOOL LIST MUST BE ISSUED IN A TOTE BOX. THE LIST SHOULD BE PLACED IN THE TAG POCKET ON THE BOX AND ACCOMPANY THE TOOLS TO AND FROM MACHINE

PIECES	NAME	SIZE	TOOL SYMBOL
	ARBORS	25 - 8348	
	BLOCKS		
	BOLTS		
	BORING BARS		
	BORING CUTTERS		
	CARRIER		
1	CHUCK (WILLARD)	AT MACHINE	
	CLAMPS		
	COLLET		
	COUNTER BORES		
	CUTTING TOOLS		
1	DRAWING	#12500	
	DIES		
	END MILL		
5	DRILLS		
	DRIVER		
1	GAGES (PLUG)		
	JIG		
	MANDREL		
	MILLING CUTTERS		
1	REAMERS	1¼"	
12	SLEEVES (WILLARD)	AT MACH.	
	SOCKET		
4	TAPS		
	TAP HOLDER		
	WRENCH		
	VISE		

CHECKS REQ'D	MANS NO	HOUR	MONTH	DAY	YEAR	SIGNED
3			4	21	1915	PC

WHEN THE TOOL LIST IS NOT CORRECT THE GANG BOSS MUST AT ONCE REPORT THE ERROR TO THE MAN WHO SIGNED THIS LIST

Fig. 10. Tool lists accompany complete sets of tools for the operations on one piece. This facilitates the issue and checking up of small tool equipment.

plants that they are often considered as little things and overlooked. The selection and care of grinding wheels is a fertile field for saving money in the machine shop, the finishing room or the casting-cleaning department.

(*Continued on page* 91)

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An advertisement for the Consulting Service Division of the Smith Gas Engineering Co.

Cheaper and better heating

—how gas is bringing this about in hundreds of ways in thousands of plants

THESE days of narrow profit margins it is often cheaper and easier to increase profits by improving manufacturing methods than it is to increase sales.

The biggest economies are found in better application of heat—fuel costs, power costs, make up from 15 to 40 per cent of manufacturing costs.

The gas in a ton of coal will give from two to five times as much power than that same ton could produce when used in the usual way. For heating, gas is easier to handle, it is always under absolute control. This makes for increased production without any corresponding increase in labor and equipment, and a decrease in spoilage and in manufacturing costs.

Do you use heat?

For heat treating and soft metal melting, cooking, drying and enameling processes, gas offers big advantages. Makers of automobiles, of building brick, and of food products, are turning to gas as a real improvement.

How to get these benefits

The engineers of the Smith Gas Engineering Company have been designing and building gas plants of every description and applying gas to every heating process for the last twenty years. Because gas users have always sought to bring this ability and experience to bear on their particular gas problems, a consulting service has been formed, a consulting service divorced from the sale of equipment. Therefore a reasonable charge is made for this service, a slight charge, all things considered.

Write for the details of this plan for serving you.

Perhaps your production problem is solved here

The application of gas to furnaces and ovens of many kinds in many industries.

The design of the most efficient and modern fuel plants for the food baking industry.

The designing and building of special furnaces for special purposes.

The designing and constructing of highly efficient metal recuperators for furnaces and ovens.

The design of metal recuperators for coke ovens which have greatly lessened the cost of construction.

The developing of the most efficient method of cleaning coke oven and producer gas.

The developing of instruments for recording the heating value of gases.

The designing and constructing of clean producer gas plants in which gas is made from bituminous coal, anthracite, coke, charcoal, and lignite, distributed like city gas for use in metallurgical furnaces, ovens, kilns and engines.

The converting of hot producer gas plants to clean cold producer gas plants, and extending the utility of producer gas to many refined heating operations where accurate control of processes is necessary.

The creation of methods of utilizing cheap gas of low heating value as efficiently as gas of high heating value.

The developing of apparatus for the efficient production of fuel gas from low grade lignite, wood refuse, sawdust, shavings, etc.

The developing for the Delco-Light Company of a thoroughly practical and highly efficient gas producer of very small size for operating farm lighting units in those countries where liquid fuels are very expensive.

During the last three years work of this character has been done for such well-known concerns as the following:

Aluminum Company of America
Indian Refining Company
Kellogg Company
International Harvester Co.
Standard Sanitary Manufacturing Co.
Ford Motor Company
National Biscuit Company
Mutual Potteries Company
Shanghai Mint, Shanghai, China
Ganga Glass Company, Delhi, India
Vacuum Oil Company, Alexandria, Egypt

Smith Gas Engineering Co., Dayton, Ohio

The Smith Gas Engineering Company (Manufacturing Division) manufactures the following equipment:

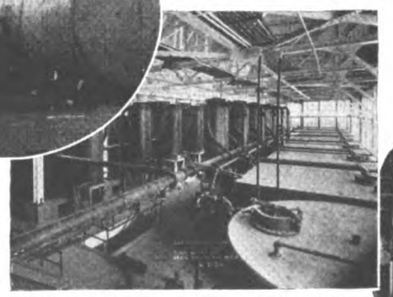
Smith Gas Producers for bituminous coal, lignite, coke, charcoal, semi-anthracite and anthracite.
Tar extractors for coke oven and producer gas.
Smith Recording Gas Calorimeters.
Smith Gas Valves. Recuperators for furnaces and ovens. Special gas furnaces. Bunkers, bins and storage tanks of every kind. Scrubbers, condensers and coolers for by-product coke oven plants.
Trench digging machines for public service pipe lines.
Garbage disposal and rendering plants for municipalities, packing houses and the like.



Ash bunker designed and manufactured by the Manufacturing Division of the Smith Gas Engineering Co.

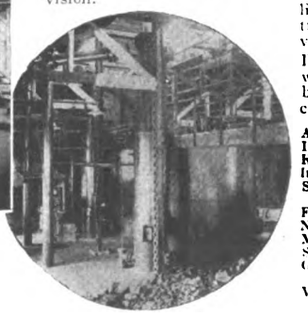


Riveting and welding seams on tanks, work done by the Manufacturing Division.



Chemical storage tanks at the Iron Mountain Plant of the Ford Motor Co. The Manufacturing Division has fabricated 73 tanks for this concern.

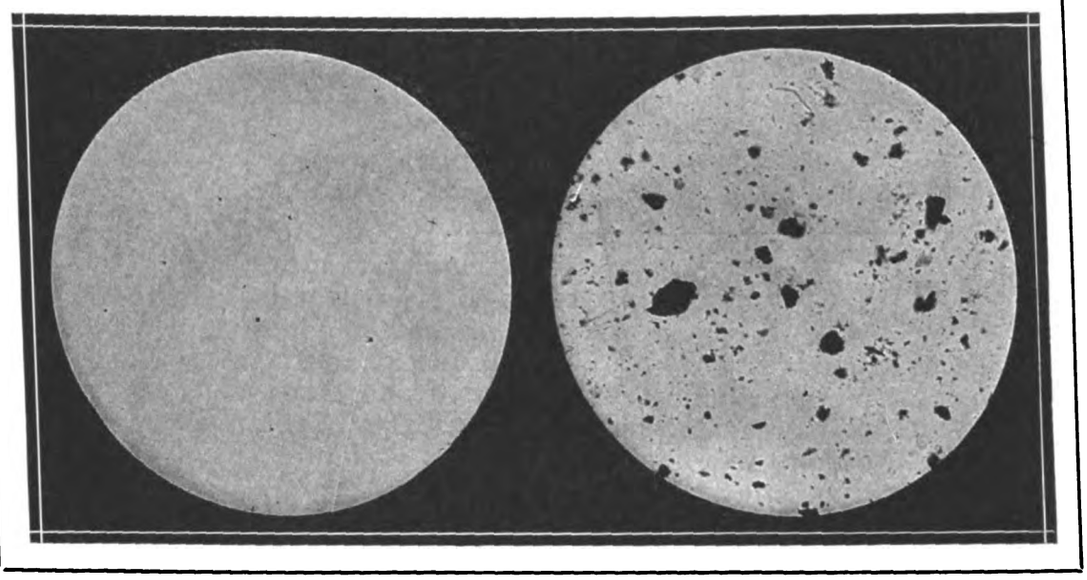
Charging floor of 3 type "F" Smith Gas Producers, products of the Manufacturing Division.

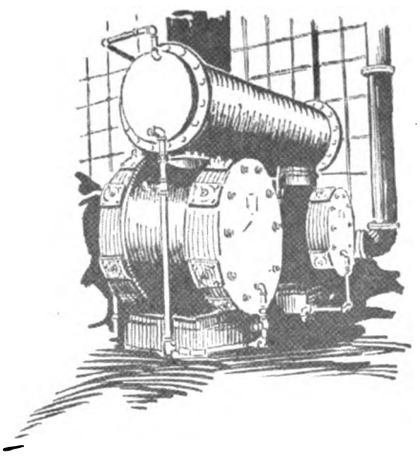


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Air Compressors, Internal Combustion Engines, Pneumatic Equipment, Etc.

VISUAL EVIDENCE
that REED AIR is Clean Air

THESE two micro photographs tell the story graphically. The one on the right shows the normal dust content in average city air, magnified 60 diameters. Over 80% of this dust is carbon—soot, coal dust, etc.—the remaining 20% comprises road dust, sand, fine particles of metal and other grit.

At the left is shown the small amount of dust in the air after passing through a REED filter. *Reed Air* is clean air—guaranteed 97% free from dust and carbon. Used wherever clean air is required. Facts and figures upon request.

REED AIR FILTER COMPANY, Inc.
211 Central Ave., Louisville, Ky. 50 Church St., New York City
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REED AIR FILTER COMPANY, Inc.
Engineering Department
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Name.....

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Reed Air
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(*Continued from page* 88)

Wheels for the grinding machines used on production work are usually selected and maintained with care. Not so much so, however, are the wheels used either singly or in pairs on "stands."

One manufacturer has a unique way of seeing that his grinding wheels of this type run at the proper speeds and hence deliver the maximum output. As the wheels wear down he transfers them to stands belted to a higher r.p.m. so that the peripheral speed is corrected for wear, or rather for reduced wheel diameter. The possibility of overspeeding by putting too large a wheel on a high speed spindle is cared for by making the wheel guard of suitable diameter, so that too large a wheel cannot be accommodated. One often finds, in the average shop, a fourteen-inch grinding wheel worn down to, say, an eight-inch diameter and hence running nearly fifty per cent. under its proper peripheral speed with a consequent loss in cutting power. Not so in this plant, however.

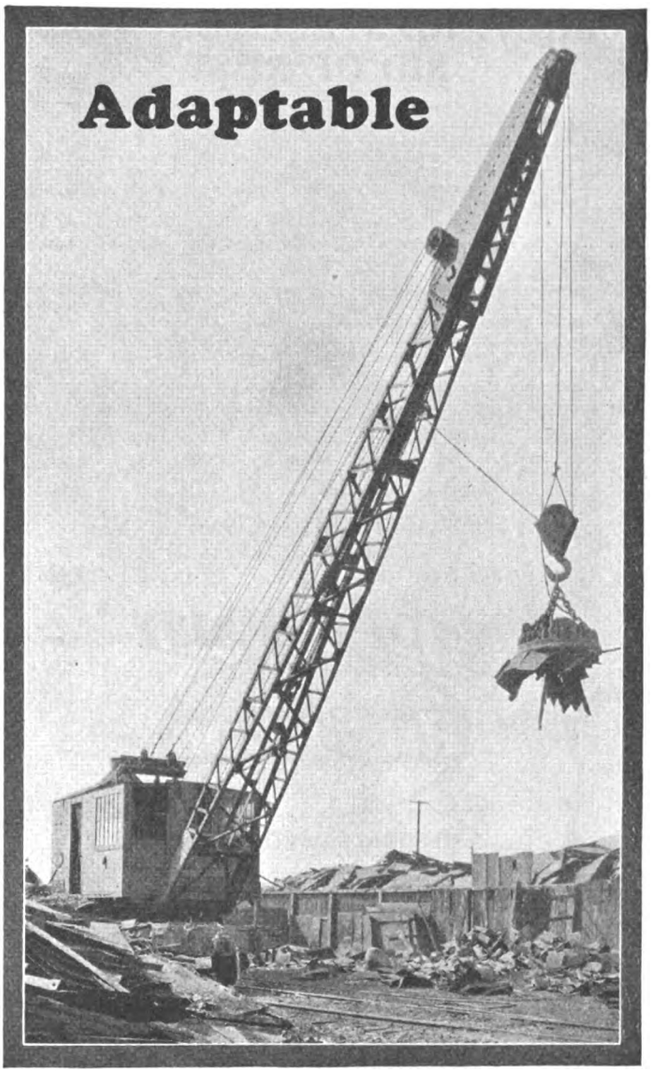
It is well worth while keeping track of hacksaws, particularly where the consumption of them is large. Tabs can be kept on the hand saws by keeping a record of the number issued and date of issue to various individuals and checking back on excessive breakage. Machine saw blades can be checked up by charging them as issued to various machines, and also by occasionally making a "square inch" cutting test. By this is meant keeping a record of the number of square inches of steel or other metal cut per day by a given number of a given make of blades. Tests of this kind lead to finding out both the quality of the blade and the quality of the operator and hence save considerable money.

The use of dull files hurts the shop pocketbook. Hence a periodic file inspection is desirable in which dull files are withdrawn from service and are either recut or discarded. Altogether, it pays to keep tabs on the small tools and equipment, just as much as it does to keep close watch on the big things.

The railroads have found that reductions in wages are not always the best method of effecting economies. The great economies recently effected by the railroads have resulted from going over all their operations with a fine-tooth comb, eliminating unnecessary waste and unnecessary operations, getting full service out of their equipment, and saving fuel in numberless small ways that bulk large in the aggregate.

One simple railroad economy is that of arranging schedules so that men and engines shall be in transit as much as possible, and not consume extra fuel and cause overtime pay by waits and delays that can be avoided by proper forethought and planning.

A fundamental problem of the railroads is to earn such net returns on the valuation of their properties as will enable them to create sufficient credit in the financial markets for borrowings and flotations of securities wherewith to purchase equipment and make needed extensions. Although most railroads have recently been able to borrow the money they require because of the vast amount of loanable funds available, the economies they are effecting will go far toward attracting adequate capital later on when loanable funds are not so plentiful.—*La Salle Extension University.*



For all Kinds of Work

McMyler-Interstate locomotive cranes are widely used in industrial plants because of their adaptability to many different kinds of service. For handling iron and steel with an electro magnet, for unloading and reclaiming coal, for handling bulky waste products and for many other duties, these cranes are proving economical and dependable. Sizes range from 10 to 50 tons. May we tell you more about them?

Car Dumpers • Coal Handling Machinery • Clam-shell Buckets

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IRON AND STEEL SURFACES RID OF RUST

Rust the grim destroyer—destroyed. Precisely what **RUST-I-CIDE**, a notable chemical achievement, accomplishes. It **CHEMICALLY KILLS RUST.** From a ruthless, destructive force, it is changed into an inert, inhibitive compound. This compound may be removed to leave metal clean and exposed or allowed to remain on the surface, making an excellent priming coat for painting or other finishing.

Prevents paint scaling—lengthens life of both paint and metal.

There are places—lots of them—in your plant—in everyman's plant, where **RUST-I-CIDE** can be used to advantage. To run over a few potential uses—production and maintenance—**Eliminates corrosion** and **produces a rust-preventing primer for painting**—Structural Steel, Railroad Cars, Bridges, Boats, Tanks, Roofing, Smoke Stacks, Fire Escapes, Piping, etc.

Provides a Surface free from corrosion, for the finer surfaces for the after Lacquer, Japan, Enamel coatings—Automobile Bodies and Parts, Sheet Steel, Metal Office Furniture, Shelving, Bins, Machinery, Signs, etc.

Removes Rust-Scale caused by heat treating by dipping smaller parts as Drills, Reamers, Taps, Dies, Bushings, Rings, Nuts, Bolts, Screws, etc.

Verdigris from Copper, Brass, etc., and a Non-Corrosive Soldering Flux for Electrical and Radio Work—Tinned, Iron, Galvanized, Copper, Brass Sheets and Parts.
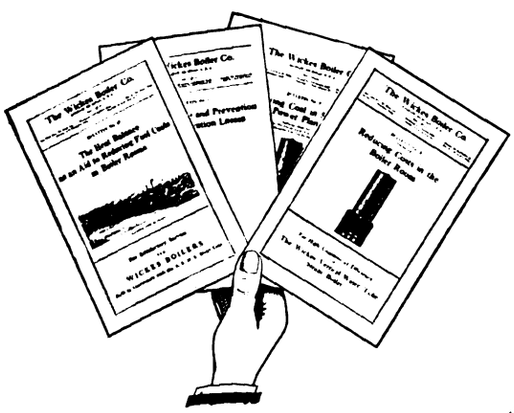
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TRADE MARK REG. U.S. PAT. OFF.
THE CHEMICAL RUST DESTROYER
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Prevent Rust's Reappearance with RUST-I-CIDE

REDUCE Boiler Room Costs!



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Gentlemen: Without obligation on my part I would like to read your helpful bulletins for reducing boiler room costs.

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The Great City Reaches Out

(*Continued from page* 16)

ster clothing and textile industry, producing more than a billion and a half dollars' worth annually, is particularly susceptible to decentralization, due not only to labor troubles and ease of plant movement, but to the presence of skilled immigrants throughout the area, and of heavy industries employing men and with surplus female labor. Knit goods, silk shirts, plush, hats, collars, lace, handkerchiefs, are manufactured in the growing centers of Newburgh, Beacon and Poughkeepsie along the Hudson, and in the heavy industry zone among the chemical, clay, iron, and mechanical industries of the Raritan River Valley in Perth Amboy, New Brunswick, and South River, while the Passaic River section from Newark to Passaic, Paterson and Little Falls, is rich in woolen, silk, and cotton mills. Women's clothing, a fashion product, is still centered in New York.

The food industry, another billion dollar giant, spreads with population, the great sugar refineries now seeking the Jersey shore for better transportation facilities, and greater space.

The heavy industries, steel, metals, chemicals, paints, show a steady hegira to the open spaces of Staten Island, the great meadows back of Jersey City, and to other areas near rail and water transportation. Such industries locating on the eastern seaboard from Middle West points choose suburban locations, one of the latest being the Muskegon Machine Company settling at Newburgh, on the Hudson.

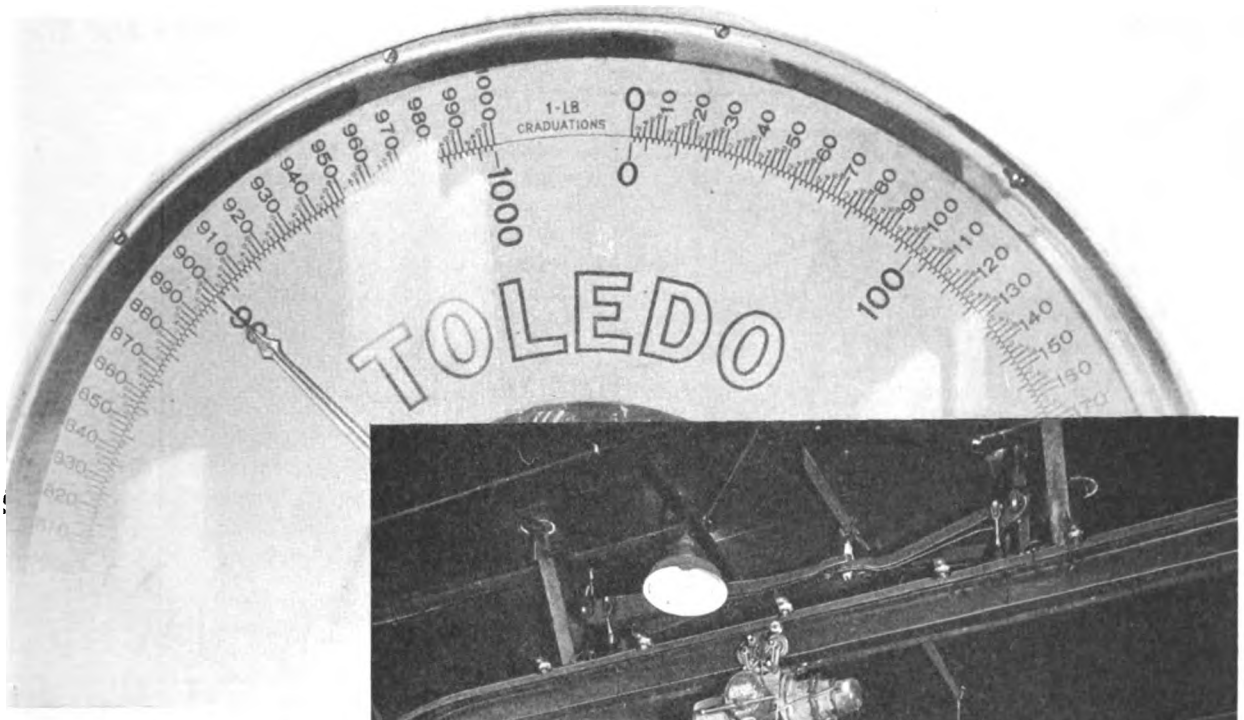
The printing plants, seeking more and cleaner space, or better labor conditions, find points in Connecticut, Jersey, and elsewhere, the American Book Company removal from New York to Bloomfield near Newark being one of the largest relocations.

New ports open up in the area. Lumber from the Pacific Coast goes direct to Poughkeepsie for distribution to the East, and likewise to the Port Newark, a modern shipping and manufacturing development backed by that city. The governmental action to deepen the Hudson to Albany for ocean ships will simply accelerate an industrial development now steadily growing. New Brunswick, a city of widely diversified manufactures, is also a seaport in the making, fifteen miles up the Raritan River, and at Jamaica Bay, Brooklyn looks forward to a wide, spacious port.

Within the city, manufacturing turns more and more to large-scale developments like the Bush Terminals, at Brooklyn, and the Hoboken Terminal on the Jersey side, providing space, transportation by rail or water, power, light, etc., and also manufacturing and selling skyscrapers like the Garment Center and proposed Millinery Building, where large numbers of manufacturers find modern facilities. Individualistic manufacturing midst congestion is a thing of the past.

The keynote of New York's decentralization and expansion is the flow of industries to towns like Perth Amboy in New Jersey and Newburgh on the Hudson, where manufacturers find water and rail connections, a diversified labor supply, and normal living conditions for the workers. Because the area has a number of such places, and because there are too many industries now in New York, the movement toward decentralization will continue and increase.

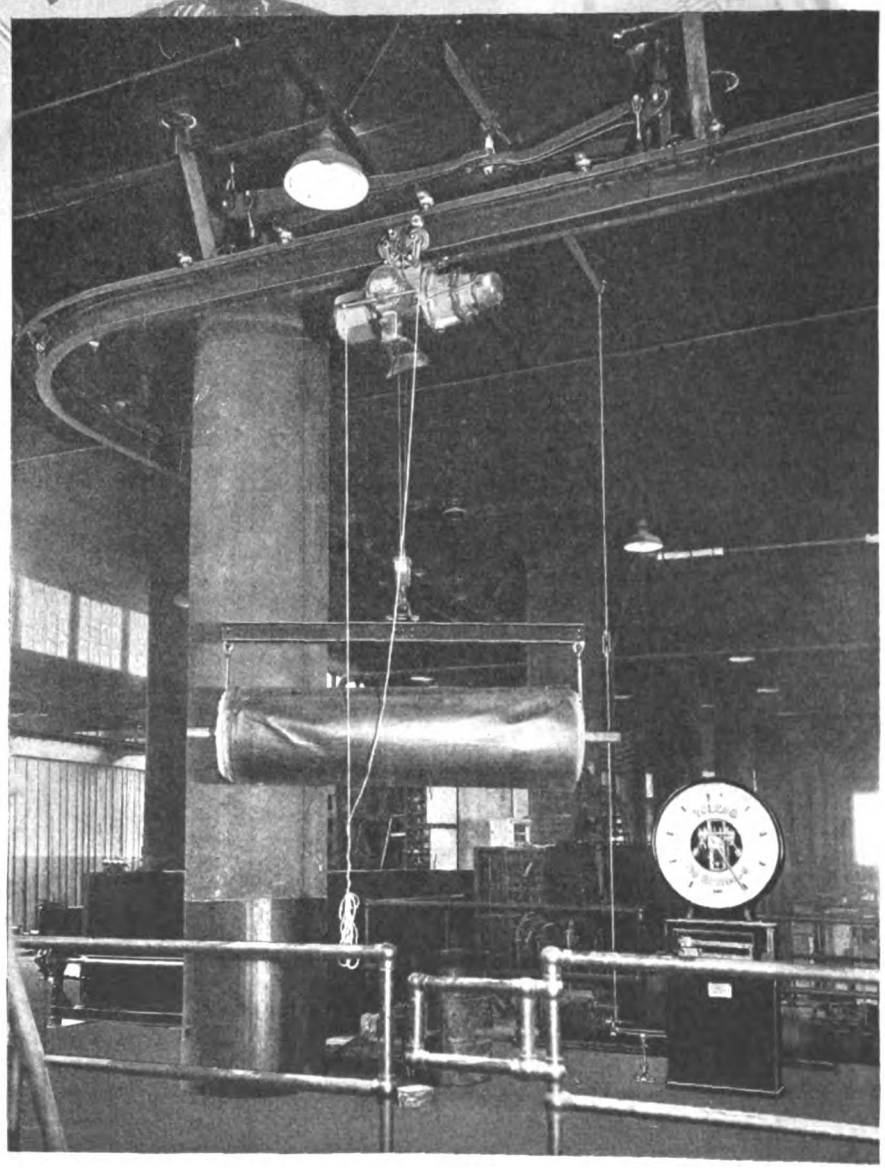
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Solving a Difficult Measurement Problem

THE Toledo Scale here shown is weighing a heavy roll of fabric in transit through the plant on an overhead rail. When the roll reaches a point in the track above the scale the exact weight is instantly shown in unmistakable figures on the great dial. There is no interruption in the progress of the material to destination; the labor of moving it on and off a scale is eliminated; and an accurate record of weight is automatically obtained.

This installation shows but one of the many unusual ways in which Toledo Scales meet the complicated measurement problems of modern industry.



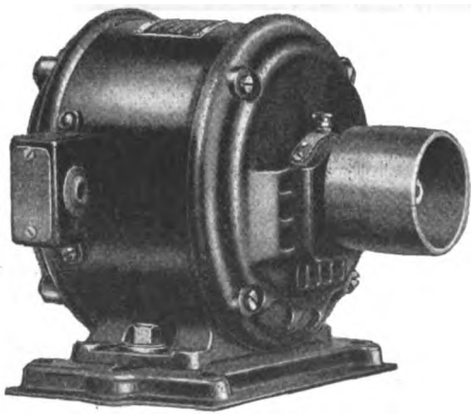
Toledo Scale Company, Toledo, Ohio
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Manufacturers of Automatic Scales for Every Purpose
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TOLEDO SCALES
NO SPRINGS HONEST WEIGHT

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¼ h. p. Century Split-phase Motor

Built to Meet Century Standards

Century Split-phase Constant-speed Motors embody the same characteristics of electrical and mechanical design that have made Century motors famous everywhere for unfailing reliability in service.

The armature of this type of Century motor is built of highest grade sheet steel laminations, correctly stamped and punched for ventilation and reception of conductor bars.

Conductor bars are of commercially pure drawn copper, generously proportioned, which terminate in copper end rings.

The field is made up of thin laminations of the same characteristics as the armature.

The field coils are form wound, in partially closed slots and insulated with fish paper and varnished cambric. The starting coils are in service only during the period of acceleration—the circuit being opened automatically when the motor approaches full speed by a cutout which has been proven by use in thousands of motors over the past ten years.

These motors have phosphor bronze bearings and ample lubrication through the use of an oil well and wool yarn. They possess the performance characteristics suited to the special service for which they are designed, such as washing machines, ironing machines, sign flashers, forge blowers and similar applications.

Built in ⅛, ⅙ and ¼ h. p. Temperature rise not more than 40° Centigrade.

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Facts and Figures for the Power Man

(*Continued from page* 31)

plants which operate this equipment is of interest. Turbines are more and more being used for the principal power generating units. In the twenty-two plants equipped with steam turbine motive power, the horsepower is more than three times that of the fifty-eight plants equipped with steam engines. The steam engine, however, is more widely distributed in industry than the steam turbine and is holding its own particularly in the small units.

In succeeding issues of INDUSTRY ILLUSTRATED we shall try to show some of the practical ways to go about reducing the cost of generating and distributing power. We shall describe the modern equipment which is available for this purpose and show how its use will help to turn waste dollars into profit dollars.

Making Metal Write Its Own Strength Record

The demand for strength and quality in the materials used in mechanism of all sorts has enormously increased during the past few years. This is particularly true in the automotive field, in which there is a constant struggle to obtain maximum strength with minimum weight.



The task of the metallurgical chemist is to continually seek after mixtures and methods which will increase the strength and wearing qualities of steel and other metals. His work is largely experimental.

The engineer physicist is no longer an experimenter but an integral part of the production force. His job is to see that each batch of metal entering the product lives up to its physical requirements. In so doing he leaves nothing to chance, for the testing machines which are designed for this work make the metal sample write its own record of strength and ductility. This is done by a moving pen upon the sheet of cross section paper wrapped around the cylinder which is located above the arm of the testing machine in this picture. Such records properly labeled and preserved for reference, form indisputable evidence of the characteristics of the materials which enter in the making of our modern mechanisms.

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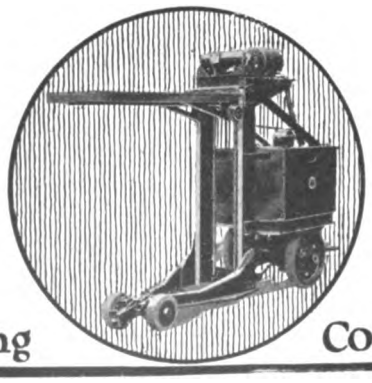
It's the Giant Handy Man Around the Shop

IN the plant of the Pheoll Mfg. Co., at Cicero, Ill., a Lakewood Tier-Lift Truck is used to cut production cost. The Tier-Lift handles 50,000 lbs. of raw material a day, from box cars, to storage, to production. All through production the Tier-Lift handles the wire on skids, then loads the finished product in cars or store room.

Many odd jobs are performed by the Tier-Lift—lifting heavy barrels of brass, for instance, where otherwise 4 or 5 men would be required.

You, too, can cut costs with Lakewood methods and machines. May we "show" you?

Send for Snap Shots of Sensible Savings.



The Lakewood Engineering Company, Cleveland U.S.A.

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Geneva Metal Security Wheels

Wheels for

Balers
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Concrete Mixers
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Logging Outfits
Planters
Plows
Portable Steam Plants
Portable Derricks
Powder Dusters
Presses
Rakes
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Trucks
Wagons
Wagon Loaders

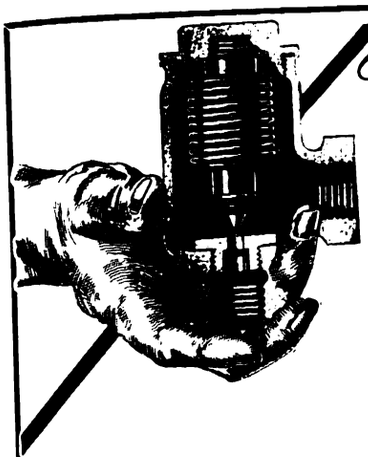
Will 25 years' experience in making security wheels in all sizes and diameters from 6 inches to 6 feet help you in solving your wheel problem?

This vast experience covering every phase of wheel construction and the metals which go into them—developed by trained engineers is at your disposal.

No problem is too great or too small. Our job is to make wheels of every description and utility—and for every industry.

The 36 kinds of wheels here enumerated, are but an indication of our capacity. Why not allow us to prove our willingness to serve you. Write and tell us your wheel problem. Let us mail our catalogues.

THE GENEVA METAL WHEEL CO.
121 Railroad Street Geneva, Ohio.



Take it on Free Trial

We are so sure that a trial of the new type Sarco Steam Trap No. 9 will convince you that it is even better than traps that cost *three times the price*, that *we* are willing to take *all the risk* in proving this to you.

Simply fill in the coupon and we'll ship you a sample trap. Test it under the most trying conditions in your plant. If you are not satisfied that it will do everything any other steam trap ever did under similar conditions—and do it more efficiently and more dependably—then ship the trap back to us and the trial won't cost you a cent.

This new trap is self-adjusting and works at any pressure between 0 and 100 lbs. Has only one moving part. The simplest, most efficient and most durable trap on the market. And you *save two-thirds* of your trapping cost.

Mail the coupon now. You take no risk. Also ask for Booklet R-256.

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Please send us on free trial 1 No. 9 Sarco Steam Trap as follows:
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☐ Send Booklet No. R-256.
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Street .....
City .....
State .....

SARCO STEAM TRAP

How a Construction Company Saves Handling Labor

Gasoline-Driven Belt Conveyor Handles Cement to Storage

EVERY handling cost which can be reduced, regardless of the location where it is being performed, if accomplished at once will be a great factor in the general prosperity of the country.

A good example of the economies that can be effected in the simple operation of warehousing cement for a road job is shown in the accompanying illustrations furnished by the White Construction Company, of Chicago, in connection with a contract for building a 7½ mile concrete pavement at Prairie View, Lake County, Illinois.

Before the conveyor was put in, and while the men were using hand trucks and lifting the sacks to the pile,

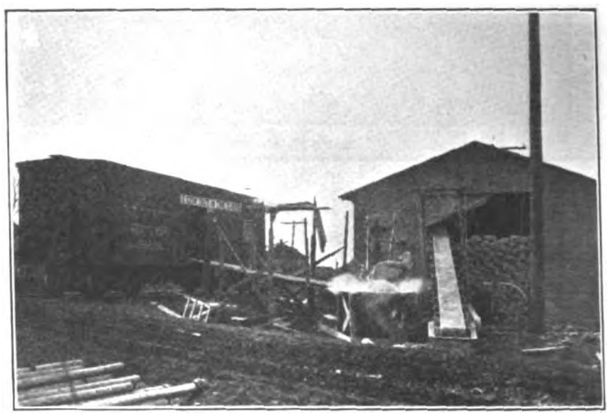


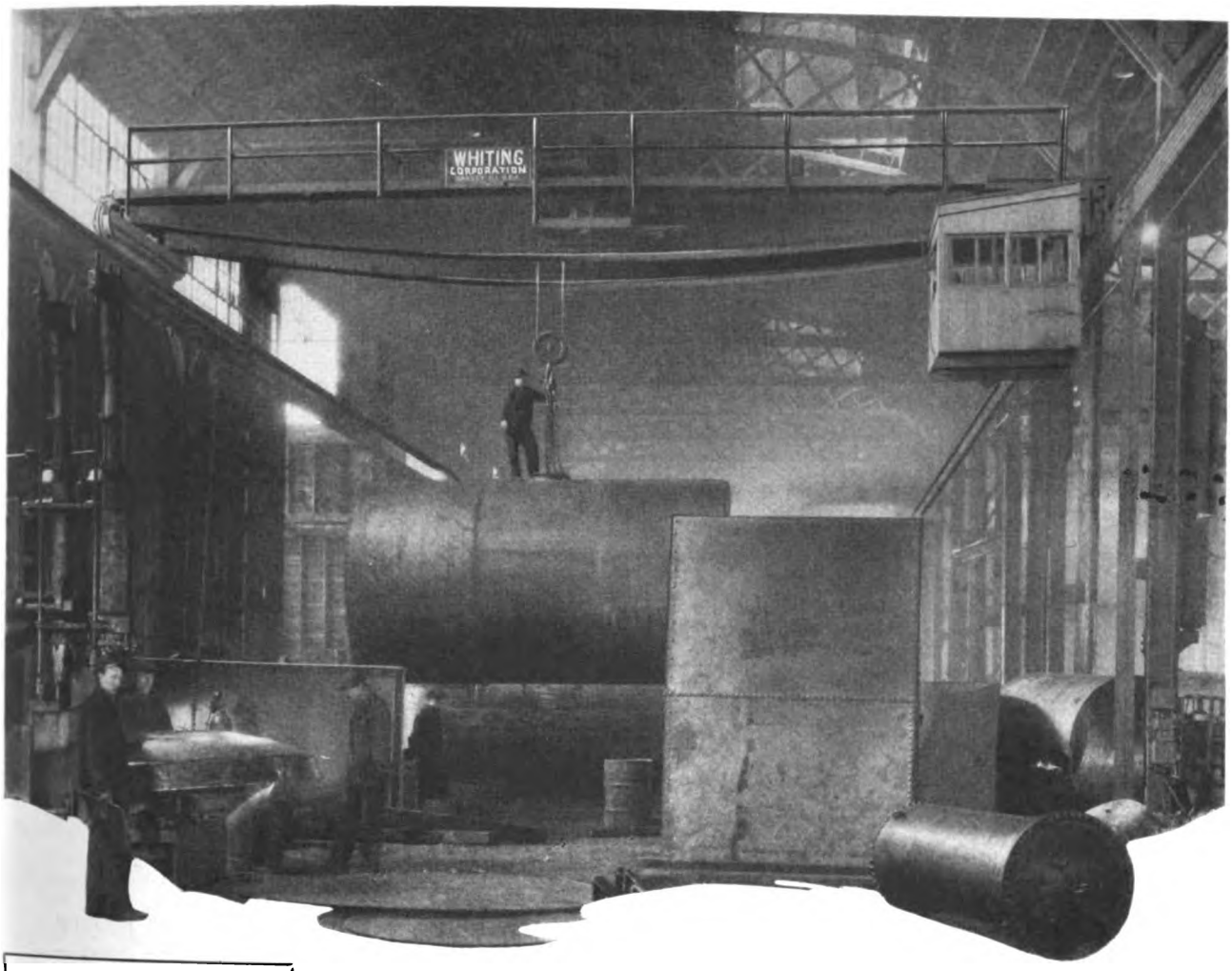
Fig. 1. If manhandling of the sacks were the only method employed, the cost of unloading a car would be considerably higher than it is with the method shown. With a slightly larger initial investment for an additional conveyor, all trucking would be entirely eliminated.

it required one day for four men to unload a car of 850 sacks and with this method of operation it was necessary to change off the gang two or three times a day, as the work was heavy. It was found after the conveyor was installed that the men could work much faster and more efficiently. In the average day, with a conveyor, four cars containing 3,320 sacks could be unloaded and the same four men could be kept on the job continuously, thus avoiding confusion. Unfortunately, no direct cost figures were kept on the handling operations alone, in connection with this same storage, but it was found that the cost of building the sheds and unloading the cement was about 20c per barrel.

The method of operation in this case is as follows: The cement was brought from the cars down a short inclined platform on hand trucks, two men doing this part of the work. As shown in Fig. 1, the men transfer the sacks from the platform to the portable belt conveyor which carries them into the shed. The end feed of the belt conveyor was placed lower than the platform so that no upward lifting in handling the sacks was required (see Fig. 2). By adjusting the height of the

(*Continued on page* 99)

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Whiting 10-ton electric traveling crane, 47 ft. span, in shop of the Hamler Boiler & Tank Co., Chicago. This illustrates a crane of common capacity for general use, although Whiting electric cranes are made in all capacities up to 250 tons. We are equipped to design and build cranes of any type, for any service.

Every Heavy Load Suggests the Use of a Whiting Crane

Boilers, tanks, structural steel, machinery — any heavy load of awkward shape suggests a Whiting crane to move it. The job is done quickly, easily, without interfering with other work.

A crane pays for itself in a short time even though used comparatively little. It is overhead, out of the way, always ready for action, with ample reserve power for any requirement.

If you are handling heavy loads, send for Crane catalog 165.

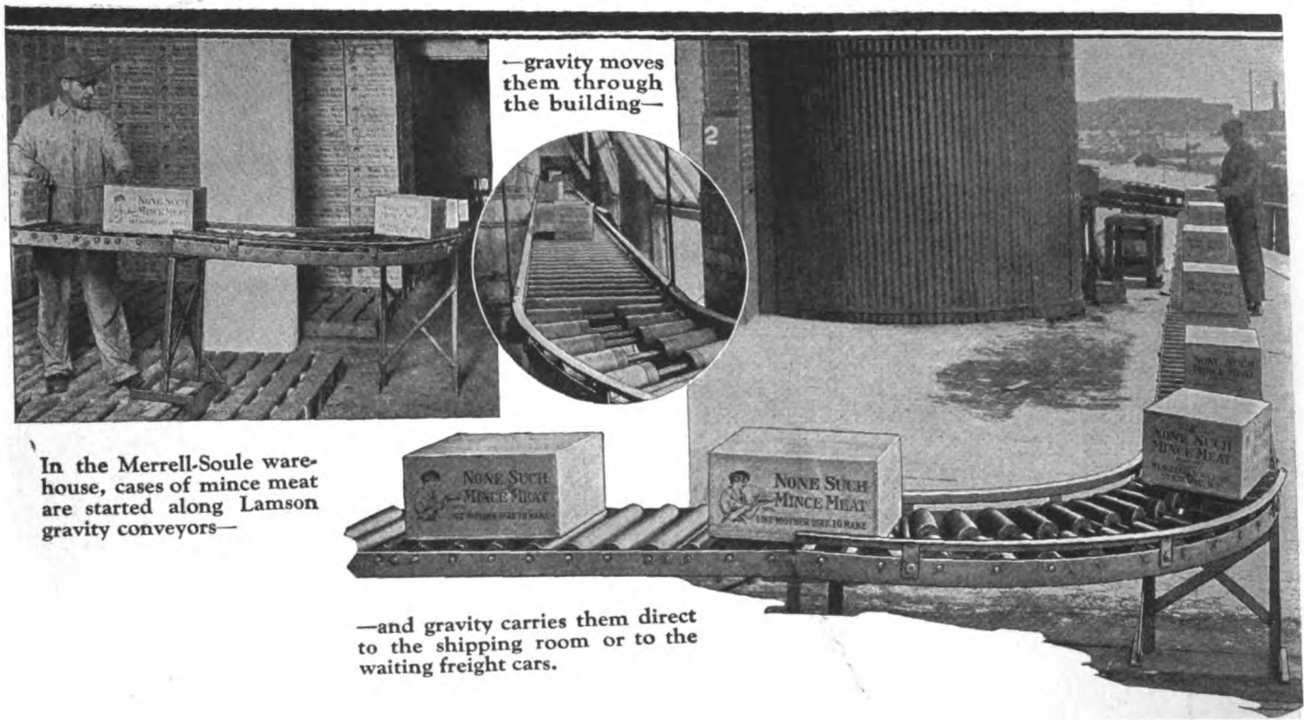
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LAMSON cuts car loading time from 30 to 7 1-2 man-hours

WHEN cases of None-Such Mince Meat were hand-trucked through the Merrell-Soule Co. plant, Syracuse, N. Y., it required six men five hours to load a freight car—30 man-hours. Today, according to Mr. George Horton, Superintendent, Lamson Conveyors enable five men to load the same car in an hour and a half.

"Conveyors pay 30% on investment"

And this is only one of the many savings. From the nailing machines to the cold storage warehouse in a distant building; and from storage to the shipping room or direct to the freight cars, Lamson carries the cases continuously, cheaply. While power is used where cases are raised, the force of gravity moves them throughout most of this journey. "Our conveyor is paying 30 per cent a year on its cost," writes Mr. Horton.

Every plant has individual problems that conveyors will solve. Perhaps you can save money by using conveyors in your packing and shipping, as Merrell-Soule have done—or perhaps your economies will come from a very different application of mechanical handling. In any case, part of Lamson service is helping you find just where conveyors will pay the biggest returns. We cooperate with your engineers, or assume the entire burden of the preliminary surveys and plans.

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When you select conveyor equipment, you can't go wrong with Lamson. Your conveyors will be fitted to your problem by able engineers. Materials and workmanship will be of the best. Installation will be by experts. You can be sure that your Lamson Conveyors will do the work intended, and that they will stand up under the hardest service.

Our nearest office will be glad to give you more information.

THE LAMSON COMPANY
SYRACUSE, NEW YORK
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(*Continued from page 96*)

discharge end of the conveyor, it was possible to eliminate heavy lifting inside the shed so one man could pile the sacks of cement clear up to the ceiling, as shown in

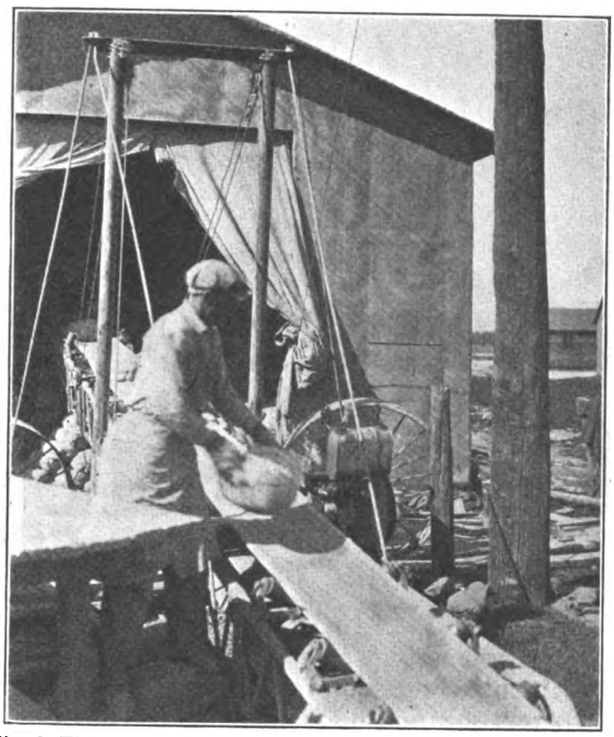


Fig. 2. This shows the method of transferring the sack from the truck dumping platform to the conveyor. The operation is simple and not at all difficult for, or fatiguing to the man.

Fig. 3. On this job, the belt conveyor unloaded in 44 working days a total of 96,116 sacks.

In order to save the expense of making an electric power connection to drive this conveyor, it was equipped with a gasoline engine, as shown in Fig. 2.

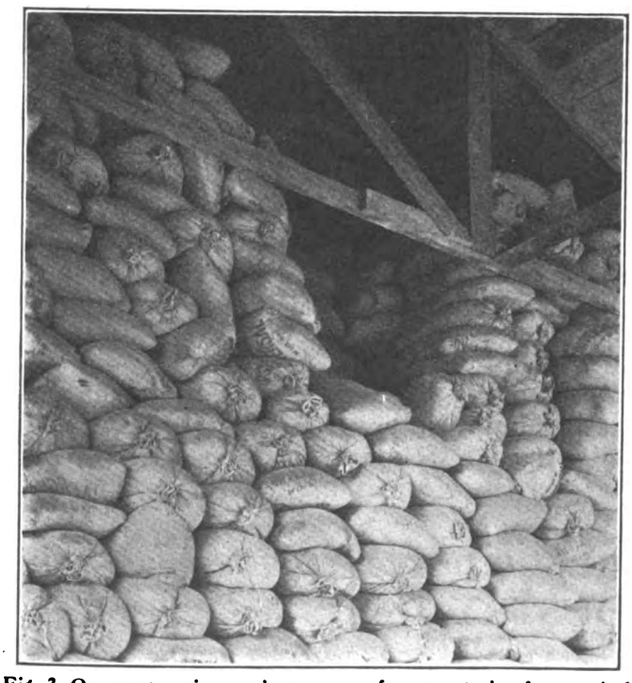


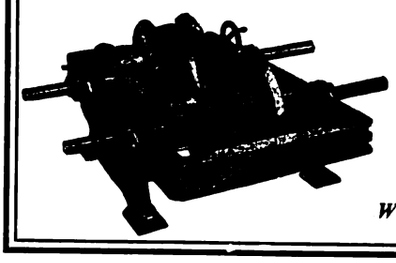
Fig. 3. On construction projects, space for storage is often a vital requirement. It must be remembered that ground storage will permit high piling, therefore storage space should be figured on the cubic foot basis instead of on the square foot basis.

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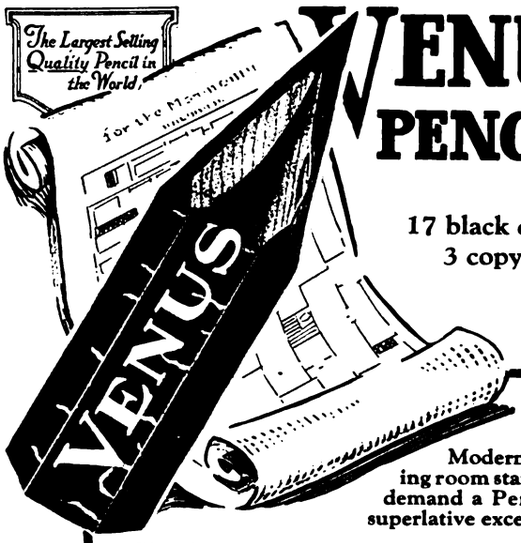
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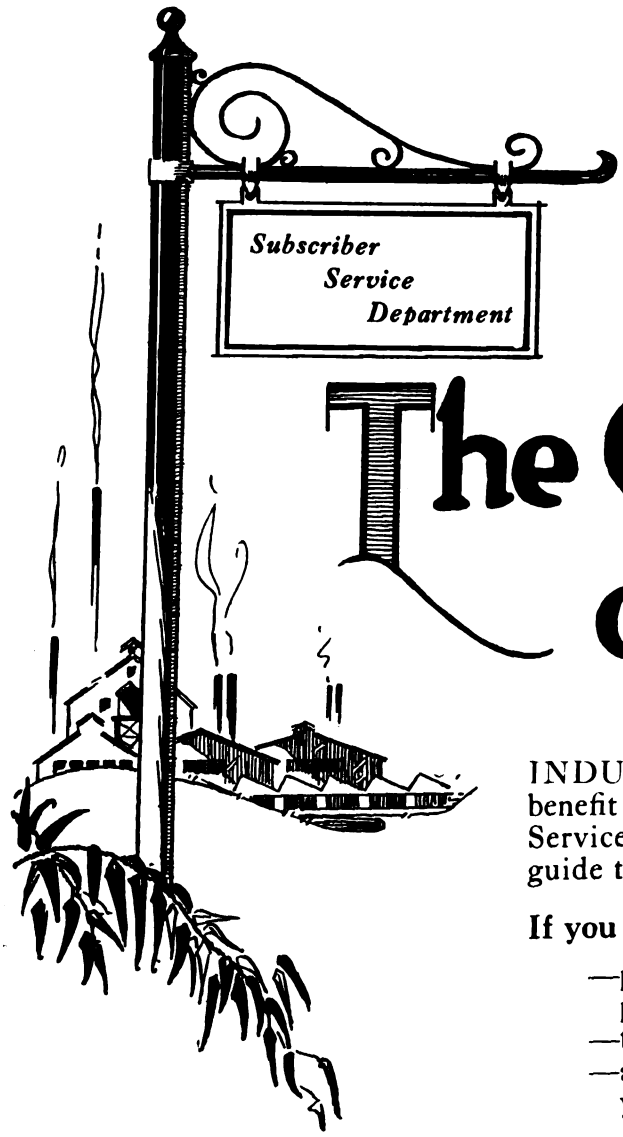
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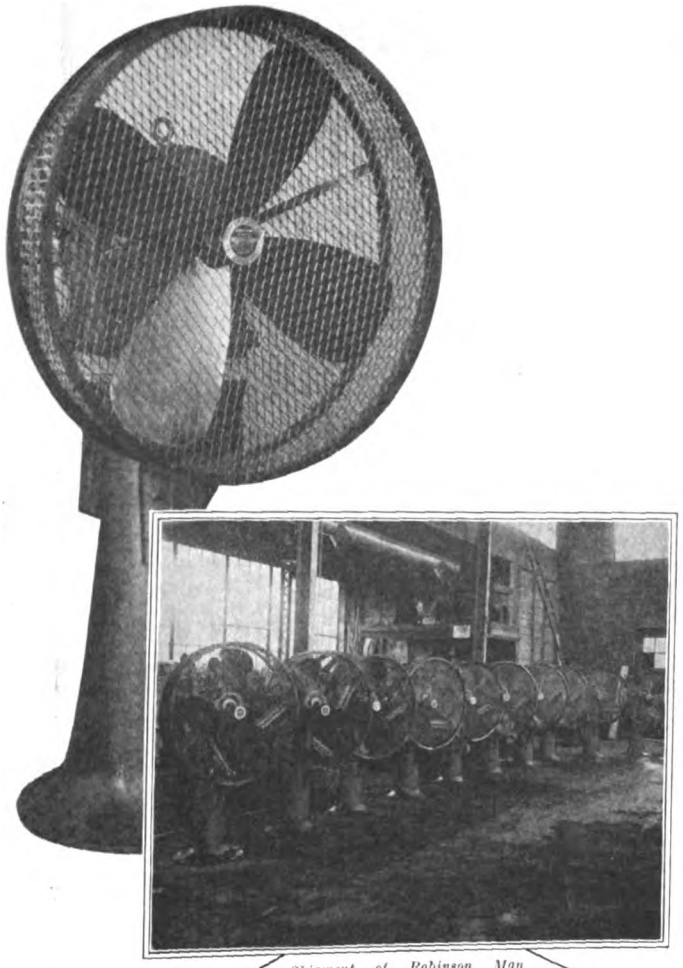
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(*Continued from page* 35)

of the earlier buildings a wooden locker was furnished each man, to be used both for street clothes and mine clothes, but this arrangement did not prove satisfactory. These early crude arrangements have undergone marked and rapid improvements. Perforated metal lockers supplanted the insanitary wooden lockers; and to improve the drying of the clothes, a steam pipe was placed under each row of lockers. Later two lockers were furnished each man, one for street clothes and one for mine clothes. The former is made of well-perforated



Fig. 3. Interior of modern wash-and-change house, showing perforated metal lockers, those on one side being for **street clothes, while on the other side they are for working clothes. Sanitary spray faucet wash troughs in center.**

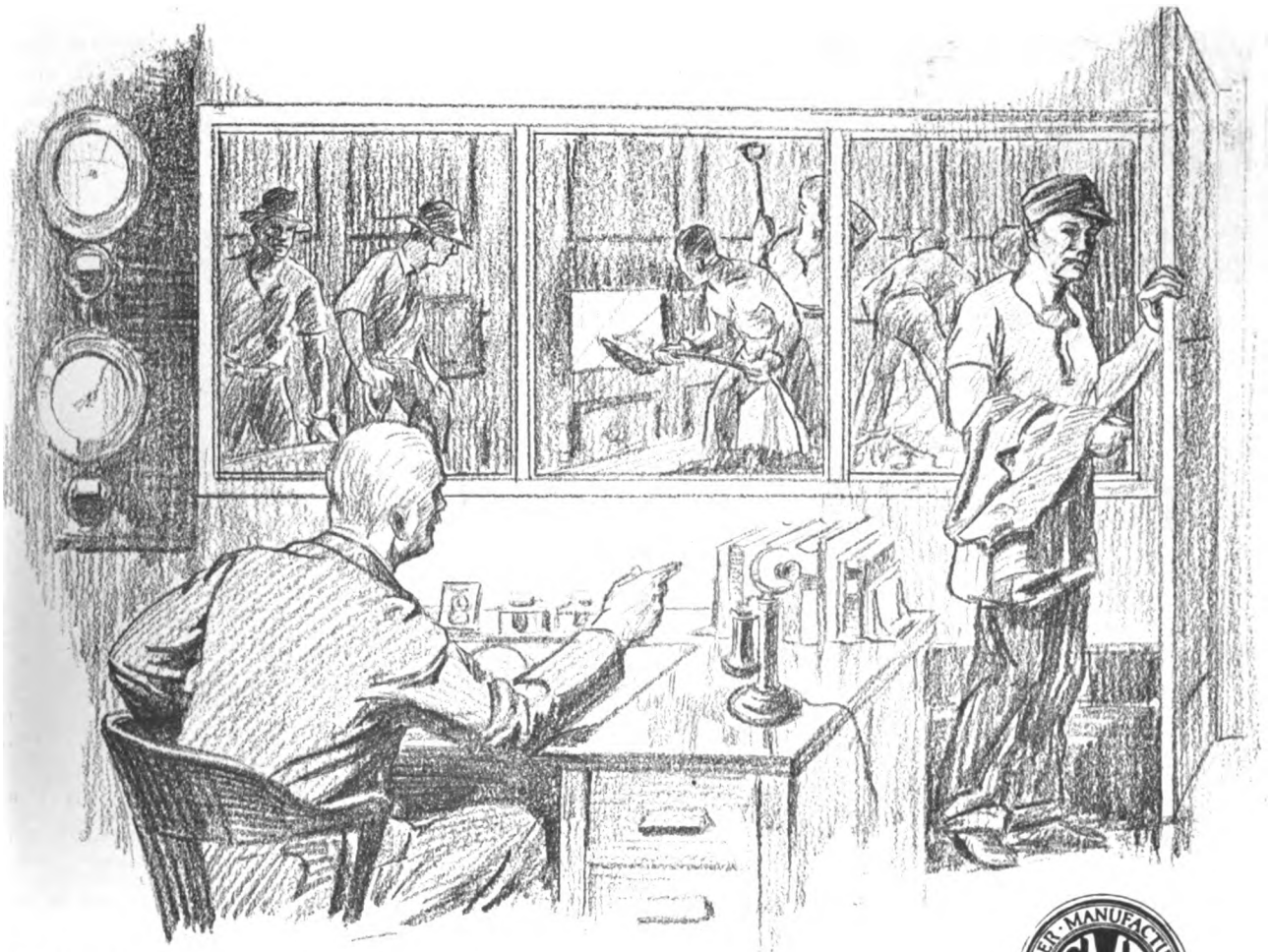
metal. The mine-clothes locker is built as air-tight as possible, except for a vent-pipe at the top; and the mine-clothes lockers are grouped together in a different part of the building from where the lockers for street clothes are placed.

Clothes racks instead of lockers have been used for drying mine clothes, with the idea of permitting the clothes to hang unfolded. Coils of steam pipe circulate among the clothes. At some of the English mines, ovens similar to those used in laundries are used for drying the miners' clothes. Some change houses have suspended from the ceiling clothes hooks which are raised and lowered by means of a chain and pulley. When the damp working clothes are hanging near the ceiling, they are in the path of warm air which is constantly passing upward through the building. When the clothes are hoisted to the ceiling, they are beyond the reach of anyone on the floor. A locking device is furnished so that the hook can be lowered only by the possessor of the key. The hooks are placed about 30 inches center to center so that the clothes of the different men will not come in contact.

For bathing purposes, shower baths are used almost exclusively in place of bath tubs. Shower baths are more hygienic and save a great deal of time. One shower bath to every 20 men is considered to be about the right proportion. Actual meter measurements made at a change house in Alabama showed that 117 gallons of water were consumed for each bath; at an Indiana mine 90 gallons were used per bath, which was reduced to 53 gallons when certain precautions were instituted. In Belgium at many wash houses 8 gallons of water per man per bath is allowed.

(*Continued on page* 104)

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Firing stokers? ...or stoker firing?

THE man who doesn't demand good tools isn't worth hiring—and that is why it is almost impossible to attract a responsible boiler room crew to a hand fired power plant.

The elimination of the incessant hiring and firing that is inescapable in a hand fired plant, is one of the strongest reasons for mechanical stokers. Not only do mechanical stokers cut the boiler room pay roll from 40 to 50 per cent., but the fewer men required to operate them are necessarily of the better class—the kind of men who take an active part in bringing out the full possibilities of this dollar saving equipment.

Picture the changed conditions in a plant where hand firing, or incorrect stoker firing, has been replaced by good mechanical stokers—

The "peak load" is no longer a matter of pushing a gang of laborers, but simply a matter of a few well trained men operating equipment that provides for maximum steam demands. Firing boilers is no longer a program of laboriously feeding an inefficient furnace, but a process of scientific combustion based on exact knowledge of the firing characteristics of the coal burned —attested by a saving of more than ten per cent. of the coal bill.

This is the picture that has become a dollar saving reality in thousands of plants. It is presented in greater detail in the interesting book "Coal—the Basic Fuel." Write to the address below for your free copy.

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Five men or three?

Stoker firing will cross at least two men off the pay roll if adopted by a hand fired plant now requiring five men. The better working conditions appeal to a better, steadier class of men.

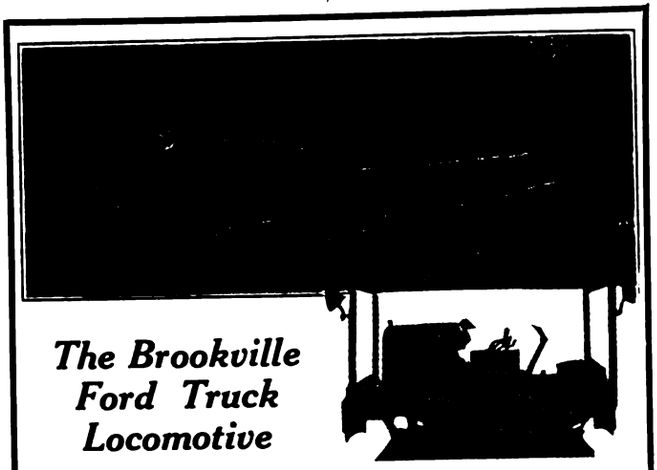
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A Low Cost Unit for Efficient Handling

The Brookville Locomotive gives you exceptional power and efficiency with the low cost maintenance cost of the Ford or Fordson Motor.

It is without doubt the most economical unit in use. Small drive wheels, short wheelbase, spring suspended throughout—irrespective as to how rough and crooked the track, Brookville will give satisfaction for loads within its capacity. Can be used over rail as light as 16 pound section.

Ideal power for all industrial track haulage propositions, either inside or outside the plant. Furnished standard in 1½, 2, 2½, 3½ and 4 tons weight in gauges 18" to 56½". Many successful Brookville installations have been made for companies whose haulages did not warrant the installation of high-priced heavy equipment. Will replace man power, mule power, and high-priced electric and steam equipment.

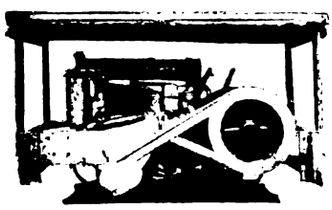
Write today for Bulletins B-1 and B-4. B-1 covers Brookville with Fordson tractor mechanism. B-4 with Ton Truck mechanism. Our engineering department is also at your service towards helping to solve your haulage problems.

Brookville Truck & Tractor Company

BROOKVILLE, PENNSYLVANIA.

Specifications

Brookville Locomotives are manufactured in two types—the Brookville Fordson Locomotive and the Brookville Ford Ton Truck Locomotive. The Brookville Fordson Locomotive uses as its power-unit the standard Fordson Tractor, positively without change or alteration other than discarding the wheels and complete front axle and steering assembly. The Brookville Ford Ton Truck Locomotive uses as the power-unit the Ford one-ton Truck throughout, including Ford motor, transmission and differential.



Brookville Fordson

See Our Exhibit *at the Ford Power Equipment Exposition, New York*

(Continued from page 102)

For washing the hands and face, the Bureau of Mines recommends flat-bottomed double troughs of white-enameled iron. A double row of spray-mixing faucets should run down the center of the trough, providing flowing water, which is much more hygienic than stationary water in bowls.



Fig. 4. Arrangement for suspending clothing from ceiling of change house. Clothes are locked into place with a key held only by owner of apparel.

Wash-and-change houses are now required by law in a number of mining states. The institution has been quite popular among the miners, statistics showing that about 85 per cent. of the men make use of the facilities daily. At some mines a fee, varying from 50 cents to $1 per month, is charged for the privilege.

CARELESSNESS, called "more powerful than the world's armies," is ravaging industry to the extent of $300,000,000 a year, it is asserted by the Eye Sight Conservation Council of America.

In addition to the money loss inflicted through accidents, heavy inroads upon the health of workers, it is said, are being made by "taking a chance." Chips, rivet heads, bits of steel, emery dust and chemical are cited as chief foes of safety.

Illumination is now recognized as a prolific source of waste. Surveys disclosing that bad lighting causes at least fifteen per cent. of all industrial accidents in the United States at an annual cost of hundreds of millions. This estimate is called by the Council very conservative.

"Investigations show," says a report of the Council, "that production increases when improvements are made in the lighting. A summary of nine such investigations showed an average production increase of 15.5 per cent. when the illumination was raised from an average intensity of 2.3 foot-candles to an average of 11.2 foot-candles. The additional lighting cost average 1.9 per cent. of the payroll.

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No wonder, then, so many thousands of the country's biggest and busiest executives are taking to *Industry Illustrated* as ducks to water. (Forty-seven presidents of AAAA industrial organizations subscribed in *one day*, the other week.) If you, too, are one of those to whom minutes are vital and keeping up with the new ideas in cutting costs, improving production, bettering human relations, handling materials economically and keeping the plant fit for profits, is absolutely essential to your remaining a success, you can join them in the sure confidence that *Industry Illustrated* will do a heap for you, in making your minutes even more valuable and your up-to-dateness more secure. Clinch it by using AT ONCE the coupon below.

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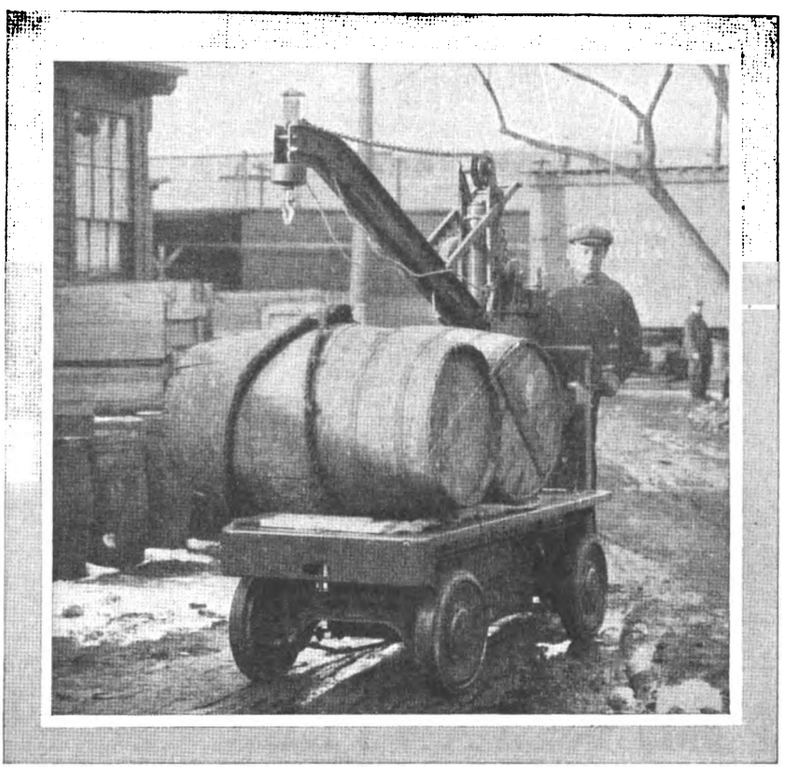
FLOORS and yards punish material-handling trucks and truck equipment. But many plant managers everywhere have trimmed the toll of wear and tear with capable electric trucks and tractors equipped with Exide-Ironclad Batteries.

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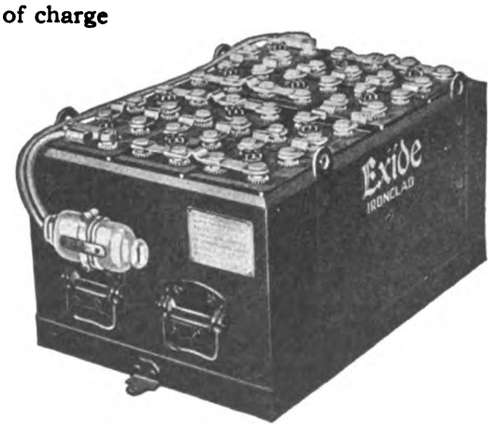
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And even the first cost is reasonable.

Why not get the close-up facts on this dollar-saving battery? They are all in the interesting booklet, "Facts for Consideration in *Selecting a Battery* for Electric Industrial Truck and Tractor Service." A postcard puts this booklet, Form 1874, on your desk, free of charge or obligation.



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A 75-Year Old "New" Idea

Container-Cars, as Used by Our Grandfathers

WITHIN the last two years much has been written regarding the use of container cars, in fact in the March, 1924, issue of Industry Illustrated it was shown how such cars could be used to assist in solving our national transportation problem.

The truth of the saying "There is nothing new under the sun," is forcibly illustrated by Fig. 1, showing the engine and tender and two cars of a train operated on the Camden and Amboy Railroad in 1849.

It is generally assumed that the container car idea is an extremely modern conception in transportation. That

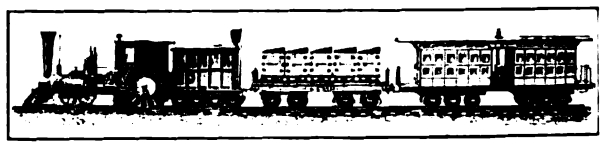


Fig. 1. This is a reproduction of the "John Stevens" locomotive and train in 1849 on the Camden and Amboy Railroad. Note the second car which embodies the much talked of container principle.

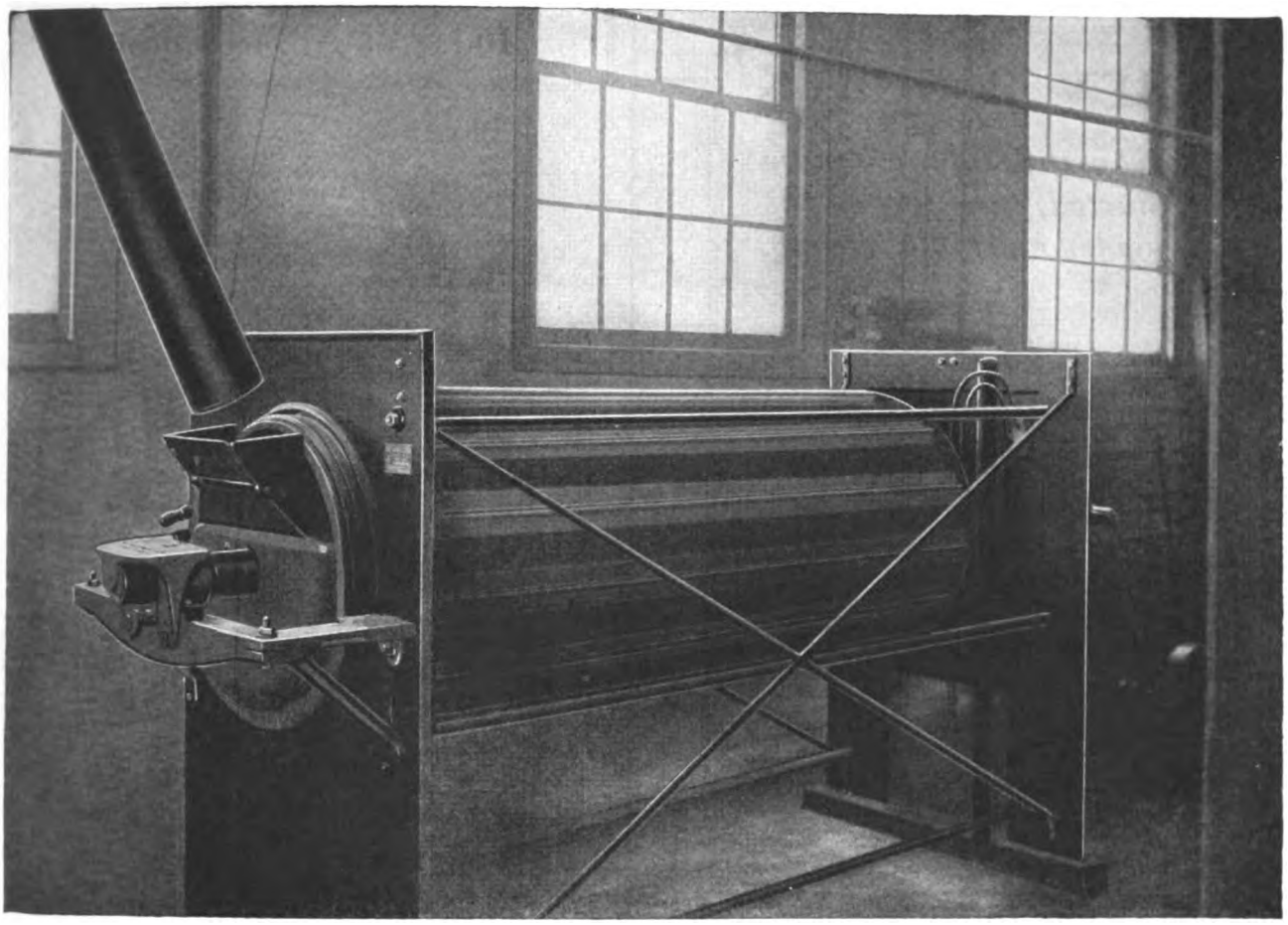
this is not the case is proved by the old picture which shows what was undoubtedly one of the original container cars operated three quarters of a century ago on one of America's oldest railroads. The car which is shown following the Locomotive tender is No. 10 of the Camden and Amboy. While it was intended for baggage and not for freight, it embodied the container principle perfectly. Each one of the five wooden receptacles which practically filled the floor space of the car is a complete container for baggage. In using this car, the



Fig. 2. Construction facilities of present-day car builders have greatly increased the capacity of container cars, and by using modern materials handling equipment, such as cranes, etc., and the motor truck, the proper co-ordination and operation of this idea is possible of greater application.

baggage was sorted and loaded in the containers according to destination. Containers were mounted on wheels and were so arranged that they could be transported across ferries, placed on or off the train and delivered to or taken from the proper stations without unloading.

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Phantom view Cocoa Bean Roasting Drum heated by G-E Clamp-on Units

Where Concentrated, Localized Heat is of First Importance

Many process machines require a definite amount of heat, and very often in a strictly limited area. For this service General Electric has developed various types of ***Sheathed-Wire*** (exclusively G-E) electric-heat units.

These Units furnish the desired degree of heat—quickly, cleanly and economically—always under easy control, and often with a considerable reduction of piping and complicated machinery. All degrees of heat, from a flush to faint-red, can be secured.

Many and various operations are performed with these units. Among them are moulding, branding, roasting, frying, embossing, vulcanizing, melting and sealing.

Complete information and service can be obtained from the G-E Sales office in the principal city that is nearest you.

Electric heat is rapidly finding new and greater uses in industry. G-E Industrial Heating Engineers are ready to show how this quick, clean heat can help you.

GENERAL ELECTRIC

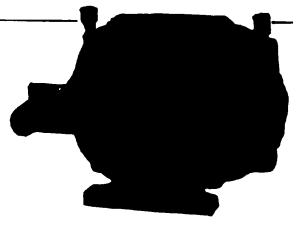
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31-3

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"Nary a spark"—

from the motor when we started, then jerked the loaded hoist into reverse.



"Show me," he said, so with the loaded Everedy Hoist traveling downward, we jerked the cord into reverse, with "nary a spark" from the motor.

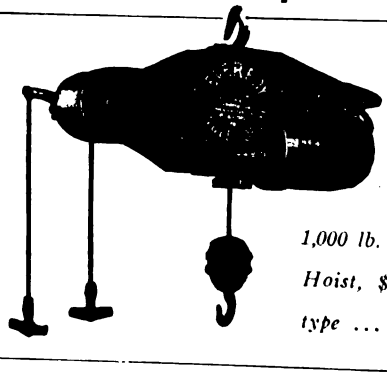
Ed. Harwick was the hardest man we ever had to sell. But Ed will tell you himself that "no other hoist has so convincingly demonstrated the superiority of its motor as the Everedy."

This motor is designed especially for hoisting, built to endure. It is easy on the commutator and brushes, maintaining a high operation efficiency.

Besides the Everedy is the most accessible hoist made. Light—500 lb. hoist weighs 215 lbs. 1000 lbs. hoist 250 lbs. Speedy—40 feet per min. A. C.; 33 feet per min. D. C. Limit stop at top and bottom, *adjustable to any point.* Suspended wherever a chain or air hoist is placed. Investigate! Write for free booklet. READING CHAIN & BLOCK CORP., 2140 Adams St., READING, PA. *Manufacturers Reading Multiple Gear Chain Blocks, Trolleys, Reading Traveling Cranes.*

Everedy

ELECTRIC HOIST ››› *multiplies man power*



1,000 lb. Single Drum Hoist, $250; 500 lb. type ... **$225.**

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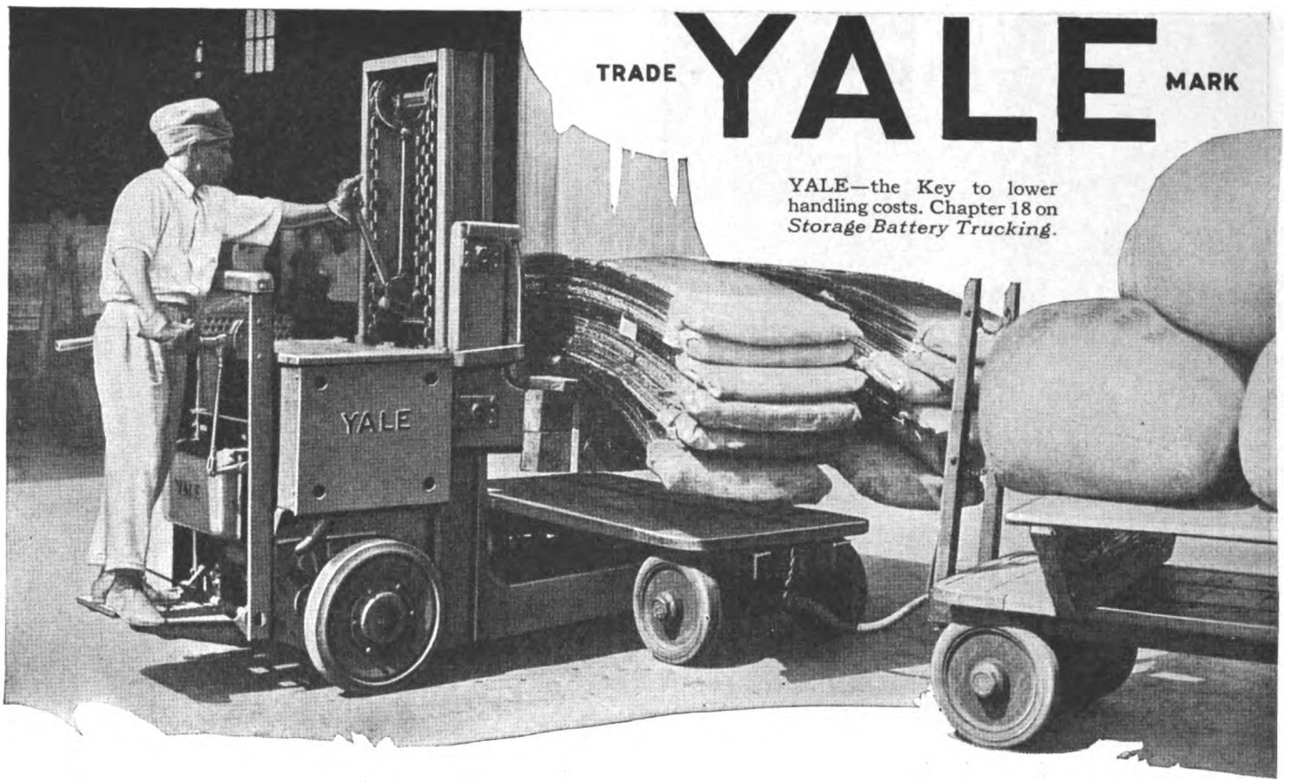
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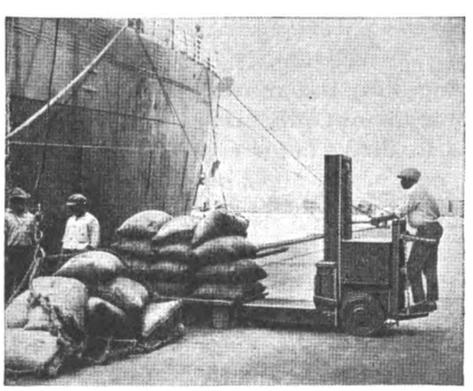
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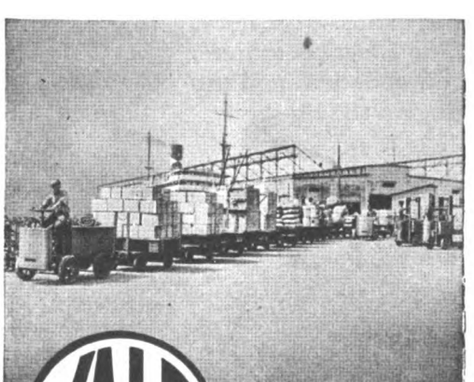
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YALE cuts the cost at Panama





More than one hundred Yale Electric Industrial Trucks are in service in the Panama Canal Zone!

The handling of miscellaneous cargoes at the terminals has been speeded up and costs greatly reduced. Yale Trucks are handling everything from pins to mining machinery; copper ingots to cotton bales.

"The Yale K22 at Cristobal is probably the greatest labor saving device adopted since the terminal outgrew freight cars and hand trucks." Freight is sorted onto skid platforms and moved locally by the high-lift K22 Truck. For long haul work the K22 places five to ten loaded skids on trailers which are coupled into trains and delivered by a Yale Tractor. Other K22 Trucks at the various destinations remove the skids and distribute their loads where required.

Proven merit has resulted in the exclusive use of Yale Industrial Trucks in the Canal Zone.

Yale Material Handling Equipment includes Spur-Geared, Screw-Geared and Differential Chain Blocks, Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment. To acquire locking control, security and convenience throughout the factory, use Yale Master Keyed Locks.

The Yale & Towne Manufacturing Co.

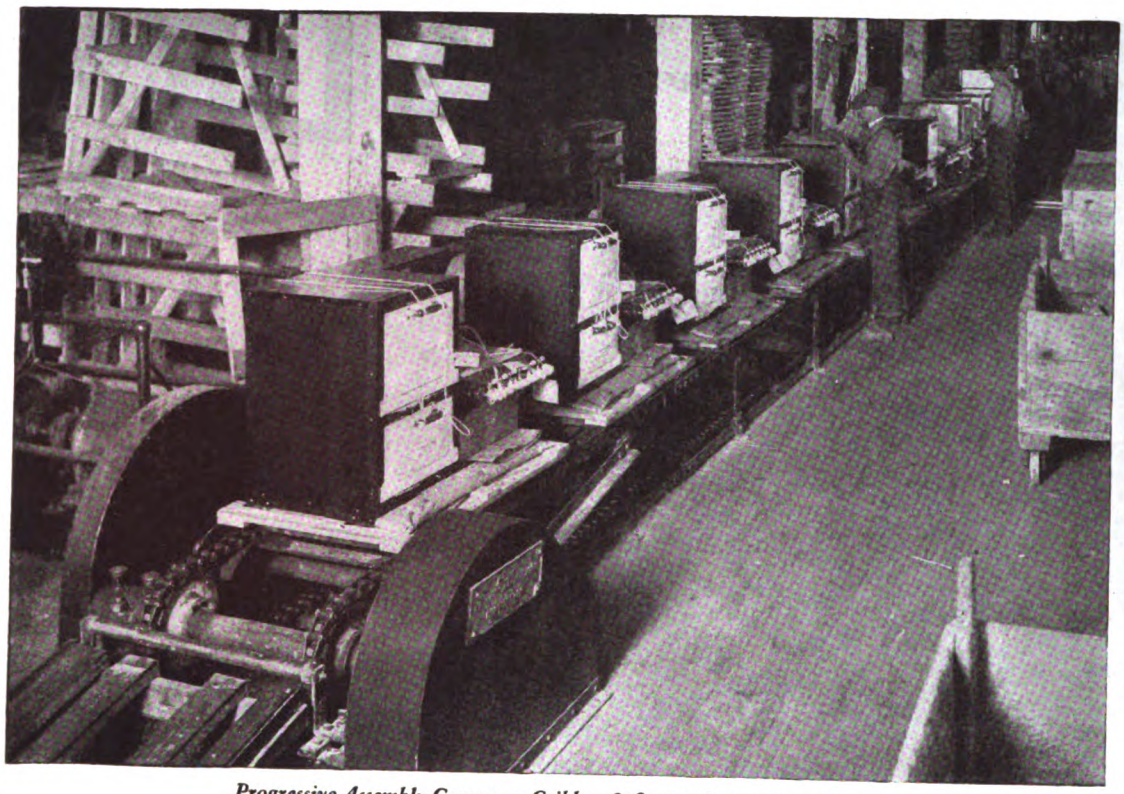
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Progressive Assembly Conveyor, Cribben & Sexton Company, Chicago

Extending Progressive Assembly to Many Products

The use of Progressive Assembly, long a standard in the automotive field, has lately been profitably extended to the manufacture of many different products.

A very successful application of progressive assembly manufacture on moving Rex Conveyors has been made in an entirely new field by the Cribben & Sexton Co. of Chicago, makers of the "Universal" Stoves and Furnaces.

The complete line of Cribben & Sexton Universal Ranges covers some seventy different sizes and styles. But by breaking up assembly operations into equally timed groups, practically all of the 70 types of gas ranges were adapted to conveyor assembly. With the exception of the skeleton frame and manifold assembly, all mounting operations are done on the Rex Conveyor.

By assembling gas ranges on the moving Rex Conveyor, this company not only made substantial reductions in direct labor cost 20% and in trucking cost nearly 50%, but also increased production from 80 to 200 ranges per day.

The photo above shows the foot end of the Conveyor delivering the stoves, ready for crating.

The Rex Conveyor is 196 feet long and carries the ranges 20 inches above the floor. It moves at the rate of 1 to 2 feet per minute, depending upon the output desired and the number of men working on the line.

Progressive Assembly is only in its infancy. It is applicable to many diverse units.

We will be glad to send information on this money-saving method to anyone interested.



REX CONVEYORS

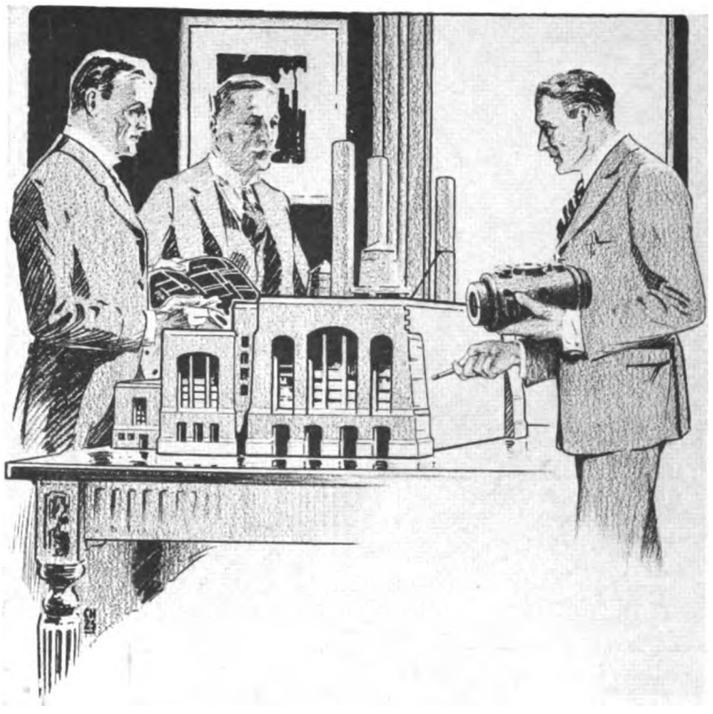
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More *Effective Power* Without Plant Expansion



YOU can increase the effectiveness of your present power plant by the installation of Hyatt bearings on your line shafts.

No need for prolonged study and discussion of engineering problems. No burdensome construction costs—no delay while waiting for the completion of physical additions to your power house.

A few hours work installing Hyatt roller bearings on your line shafts and the power available will be increased 15 to 25%.

Hyatt hangers reduce plain bearing friction 50%. A 50% reduction in friction means 15 to 25% less power consumption.

Hyatt line shaft roller bearings are self-aligning. No adjustments are necessary.

They do not run hot. Production delays are done away with because the bearings do not get out of order and cause breakdowns.

They are quickly and easily installed. Give them a new supply of oil three or four times a year and forget them. They will last a lifetime.

You can cut down your power costs or handle more machinery with your present power house by the installation of Hyatt roller bearings on your line shafts. Telephone the nearest mill supply dealer, or drop us a line and one of our line shaft engineers will call and give you full information.



Write for a copy of the Hyatt Line Shaft Bulletin No. 130. It contains interesting data on power transmission.

'Phone the Nearest Mill Supply Dealer

HYATT ROLLER BEARING COMPANY
NEWARK, NEW JERSEY
PACIFIC COAST ADDRESS: SAN FRANCISCO, CAL.

HYATT ROLLER BEARINGS FOR LINE SHAFTING

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THE SHEPARD ELECTRIC LIFTABOUT

Lifting and Load-moving equipment for every need

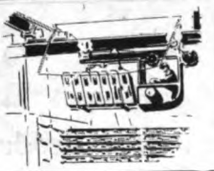
Floor Operated Hoists
LiftAbout and Lift-About Jr. in capacities of ½ and 1 ton, and 500 pounds respectively; other hoists in capacities to 10 tons.



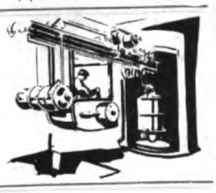
Single I-Beam Cranes
Made in capacities to 5 tons, with floor, cage or remote control. Equipped with hoist to meet any requirement.



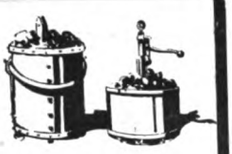
Aerial Railway of Industry
Interdepartment overhead transportation. One or more cage-operated hoists running on Shepard Transfer Crane, track and switches.



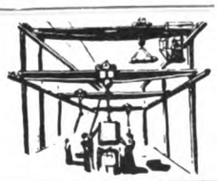
Cupola Chargers
Floor- and cage-operated hoists specially designed for charging. Also used for yard handling and general lifting in the foundry



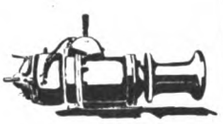
Charging Buckets
Furnished in either bottom drop or umbrella type. Bucket may be removed and an electro magnet used when that method of charging is desired.



Traveling Cranes
Made in capacities to 30 tons, furnished to suit the individual requirements

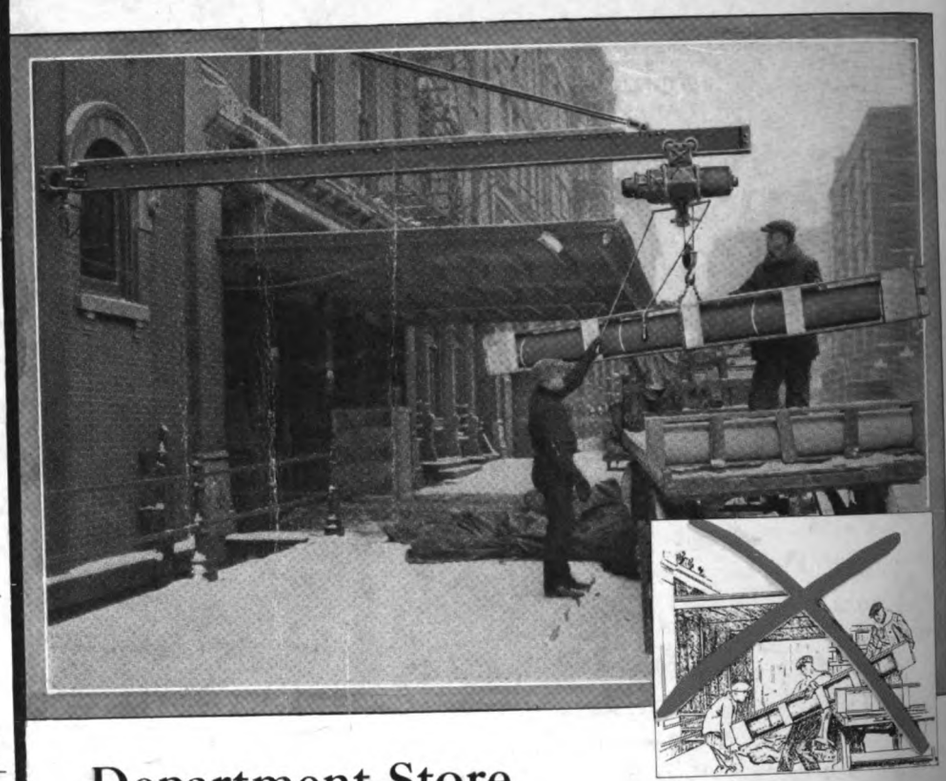


Winches, Back Geared Motors, Speed Reducers
also derrick and elevator hoists, and allied equipment.





Send for this "Book of Illustrated Economies." It contains 68 pages of facts, photos, and data about LiftAbout economies in practically every business.



Department Store, Printer, Hotel, Meat Packer, Cigars

Although in widely different lines of business, the following concerns and thousands of others find in this sturdy *little* electric hoist remarkable economies.

Herpolshiemer Co., Grand Rapids, speeds up department store deliveries and saves a man.

Sobar Co., Printers, Philadelphia, uses LiftAbout for a freight elevator—$2,200 in equipment was saved.

Marne Hotel, Akron, Ohio, uses one LiftAbout to handle ashes, and one to lift miscellaneous loads. The work is done in one fifth the time—and more than $1200 a year is saved in labor.

Gerish Co., Detroit, packers, with one LiftAbout save $6,552 a year in labor. In one day as many as 125 hogs have been killed by 5 men. Without a LiftAbout to help, 40 men could hardly do this job.

United Cigar Stores Co., Boston, uses a LiftAbout to handle ashes through sidewalk hatchway, and saves $40 a day.

Many and varied are the uses for Shepard Electric LiftAbouts. Made in 1/2 and 1 ton capacities; the LiftAbout Jr. for 500 pound loads. Standardized manufacture, and quantity production make their price low. You are invited to write for our book.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities
Largest Manufacturer of Electric Hoists in America

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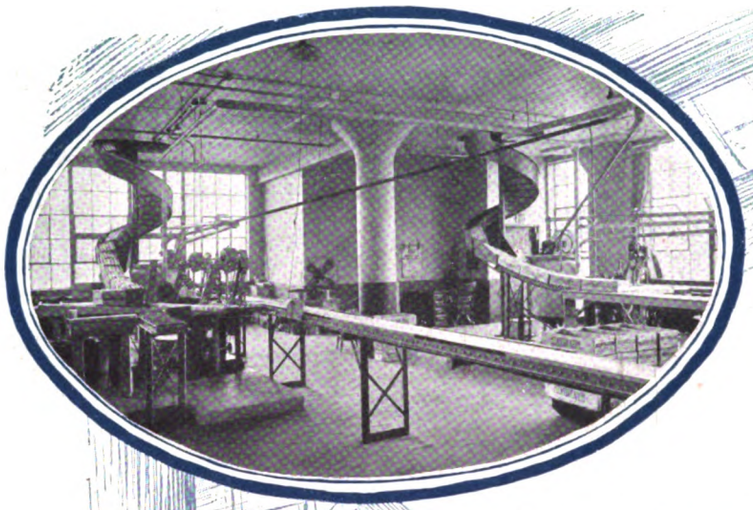
Practical Management Pictorialized

Reg. U.S. Pat. Off.

MAY-1925



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What'll We Do With Bill?

AFTER Bill has been with us for twenty or thirty years and begins to show signs of wear, what are we going to do with him?

When Bill came with us he was young, husky as an ox, willing, and able to do as much as two ordinary men. That's why we always kept him during busy periods and dull ones.

Bill works for us. Bill works for you. He works in nearly every industry. Some plants are using equipment that saves Bill's back, and at the same time enables him to do as much as two men, just the same as he did twenty years ago, when he depended on strength alone.

From a humane standpoint you should conserve Bill's strength; from an economic standpoint you should not overwork your machine; from a humane standpoint Bill's years should be prolonged if you can do it—for after you have worn Bill out—who'll take him? From an economic standpoint, let Bill do as much for you as he can and will do, if you give him proper equipment. Be good to Bill. Be fair to yourself.

If you would like to see Catalog S-5 we'll be pleased to send it. It shows how many industries have solved the problem of Bill.

The oval illustration (above) shows how a Standard System helps The Mentholatum Company conserve its labor.

MENTHOLATUM CO., BUFFALO, N. Y.

STANDARD CONVEYOR COMPANY

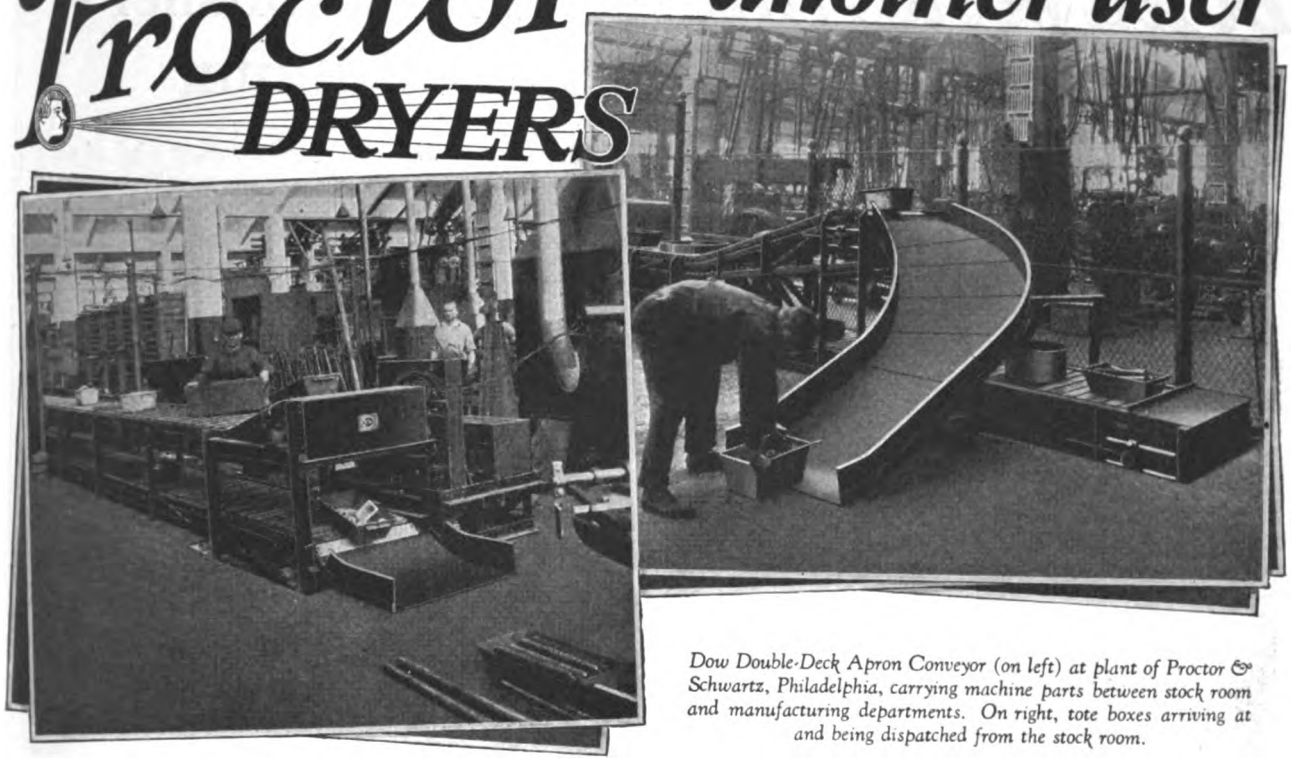
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Proctor - another user

DRYERS



Dow Double-Deck Apron Conveyor (on left) at plant of Proctor & Schwartz, Philadelphia, carrying machine parts between stock room and manufacturing departments. On right, tote boxes arriving at and being dispatched from the stock room.



One of the many types of Proctor Drying Machinery in the manufacture of which the old established company of Proctor & Schwartz use Dow Conveyors for the saving of time, labor and floor space.

JOHN J. Businessman rose from his desk, lighted a cigarette, put on his hat and left the office for the day. Little did he realize that in the manufacture of the desk he had just left, the cigarette he was smoking and the hat he was wearing, Proctor Dryers had played an important part. Little did he know that in the manufacture of Proctor Dryers themselves, Dow Conveyors had contributed efficiency and economy. And yet, all along the line, from the very first step toward production to the ultimate consumer himself, Dow Conveyors are cutting costs and increasing profits. Where does *your* business come in? Ask our nearest office.

THE DOW CO.
LOUISVILLE, KY.

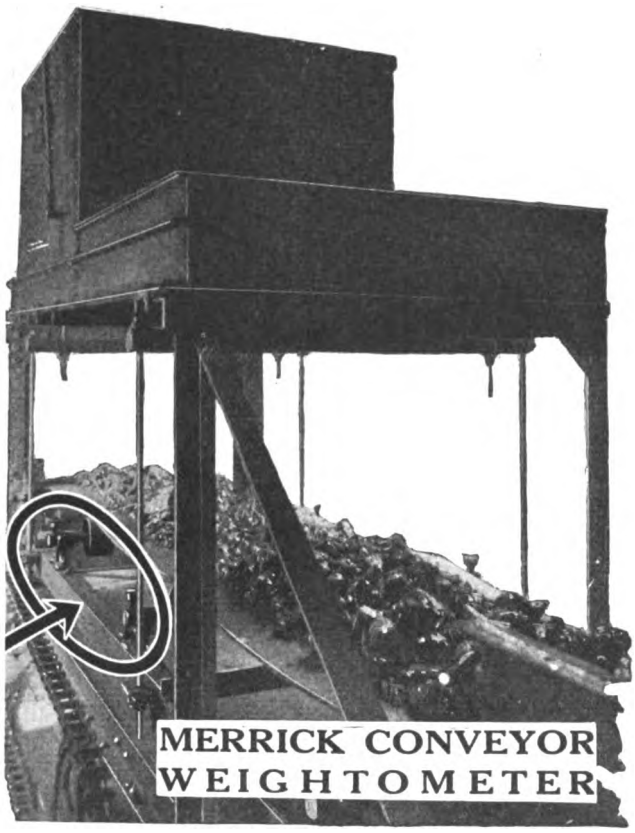
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Do You Waste Time in Checking Weights?



WHY not weigh as you convey your materials with a Merrick Weightometer?

You might as well get one more operation from your conveyors, particularly if you can save time, obtain accuracy—without additional labor or handling. You simply attach the Merrick Weightometer to your present conveyors, start the material moving and at a given point the weights are recorded accurately and guaranteed to be at least 99% of the true weight.

Merrick Weightometers automatically and accurately check your bills of lading. The weighing check on your incoming and outgoing materials will result in considerable savings and will pay for the Merrick Weightometer in a comparatively short time.

Write today for the Merrick Book illustrating the various installations, which graphically show how many of the large industrials are saving thousands of dollars annually through the use of Merrick Weightometers.

MERRICK SCALE MFG. CO.
180 AUTUMN ST. PASSAIC, N. J.

The Publisher's Column

What is the most important, most vital of our natural resources? Asked this question, most of us would think of coal, iron, petroleum; entirely ignoring the obvious answer—*air*. It is so obvious, so taken for granted, that we are prone to overlook its importance.

Especially is this true in the power plant—where, as a matter of fact, air in huge quantities must be supplied for the proper combustion of the coal. But, for economical power generation, it is not sufficient to supply "plenty of air;" too much is as bad as too little; and air supplied at the wrong place, or in cramped quarters, is expensive.

A competent engineer is credited with the statement that not more than three out of every ten industrial power plants get even one-half the attainable heat value from the coal they burn; and this simply because of lack of appreciation of the importance of that most vital natural resource —air.

Why this is so, and what to do about it, Mr. Juraschek tells elsewhere in these pages.

Many volumes have been written—and are being written—about proper combustion. Most of them are either too theoretical or too technical for any but the highly trained engineer to understand. That is why we have asked Mr. Juraschek to present these facts in such fashion that they can be readily understood—and directly applied—by the men who actually control or operate the "average" industrial power plant.

That same principle of presenting practical information, and presenting it in readily understandable fashion, is the real mission of INDUSTRY ILLUSTRATED. It applies to the articles on power which we are now presenting, and it will apply equally to an interesting series of articles on everyday shop problems, which we now have under way.

Industry Illustrated

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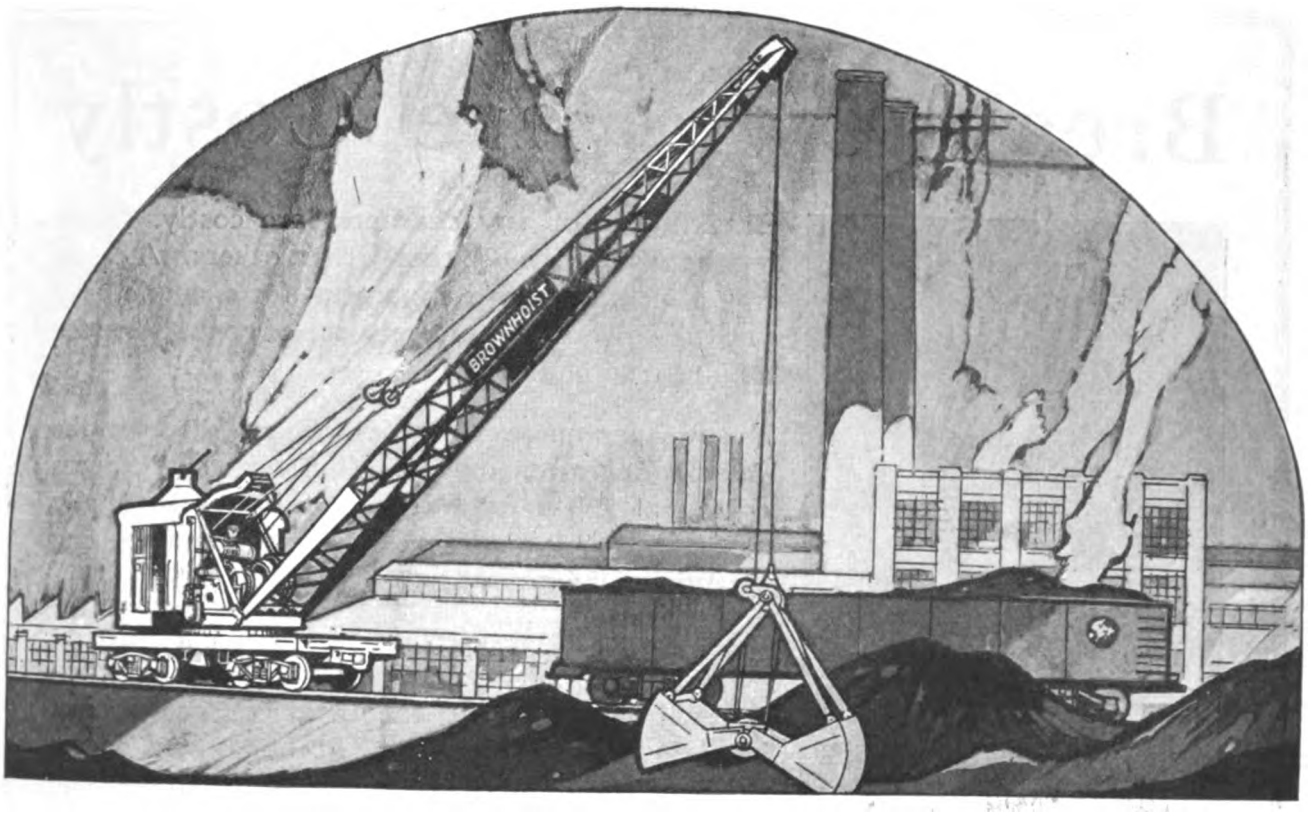
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Brownhoists Make Both Your Man-power and Horse-power more Valuable

Brownhoist Products

Heavy Dock Machinery, Locomotive Cranes, Belt Conveyors, Chain Conveyors, Bridge Cranes, Gas Shovels, Buckets, etc.

—

Remember that the Brownhoist engineering staff is always at your service in helping work out new economies for every sort of material handling.

SKILLED operators, costly fuel—both these factors in crane operation can produce *more* with the latest models of Brownhoist Locomotive Cranes.

You'll find rugged simplicity in every part, friction and wear reduced to a minimum, controls that are more easily handled, and greater operating speed and daily capacity.

The new 25 ton and 22½ ton Brownhoists have received not only the approval, but the enthusiastic praise of the most exacting buyers and users of locomotive cranes. We believe that it would be very much worth your while to know more about them. May we mail you descriptive matter?

The Brown Hoisting Machinery Co., *Cleveland, Ohio*

Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans, London, Eng.

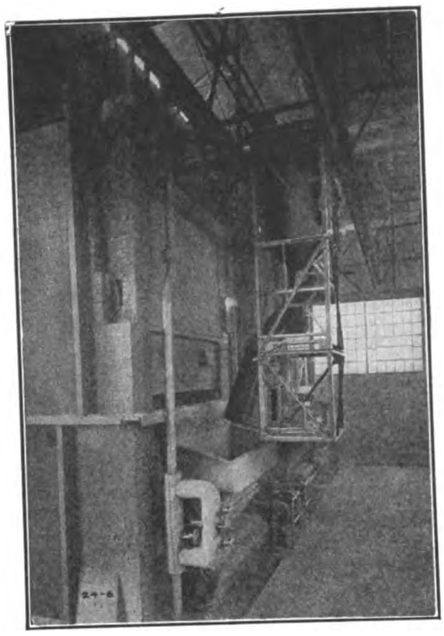
BROWNHOIST

GOOD MATERIAL HANDLING MACHINERY

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Breakdowns are Costly



Hunt Weigh Larry over stoker hoppers in boiler room of the Gas Plant—Philadelphia Suburban Co., Chester, Pa.

The all-concrete structure including skip hoist, cut-off gates, swiveling chutes (adaptable to any position for loading both railroad cars and wagons) and weigh larry; was designed and built—by the C. W. Hunt Co., Inc.

HUNT

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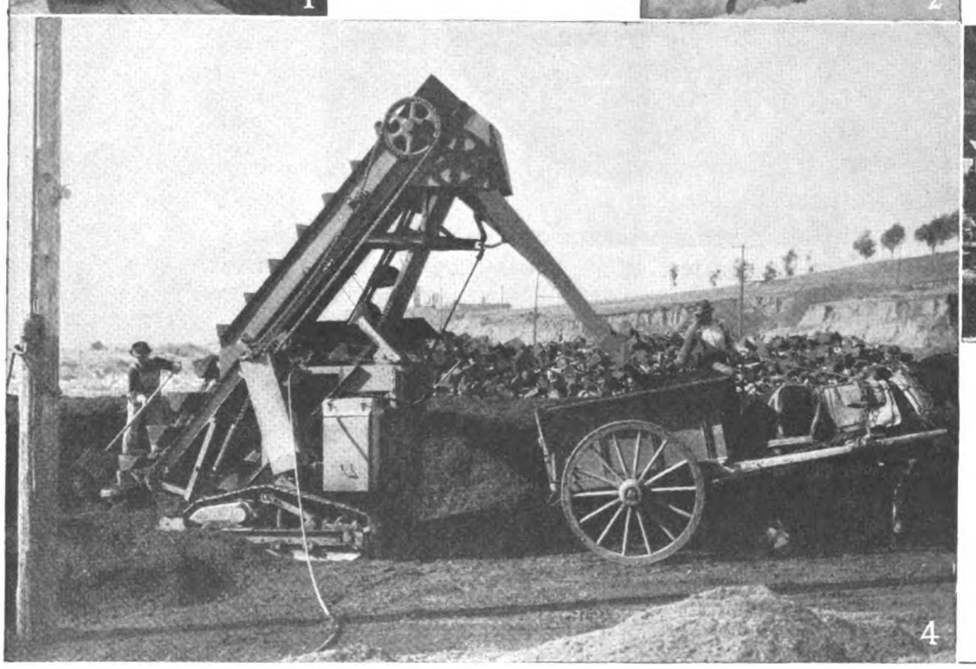


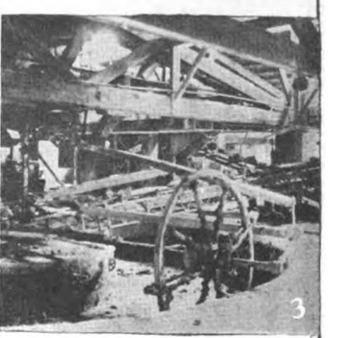
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3—*A Barber-Greene handling soft mud at the Multon Hollow Fire Brick Company, Woodridge, N. J.*





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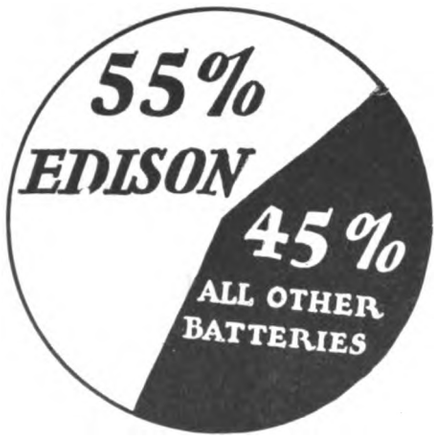
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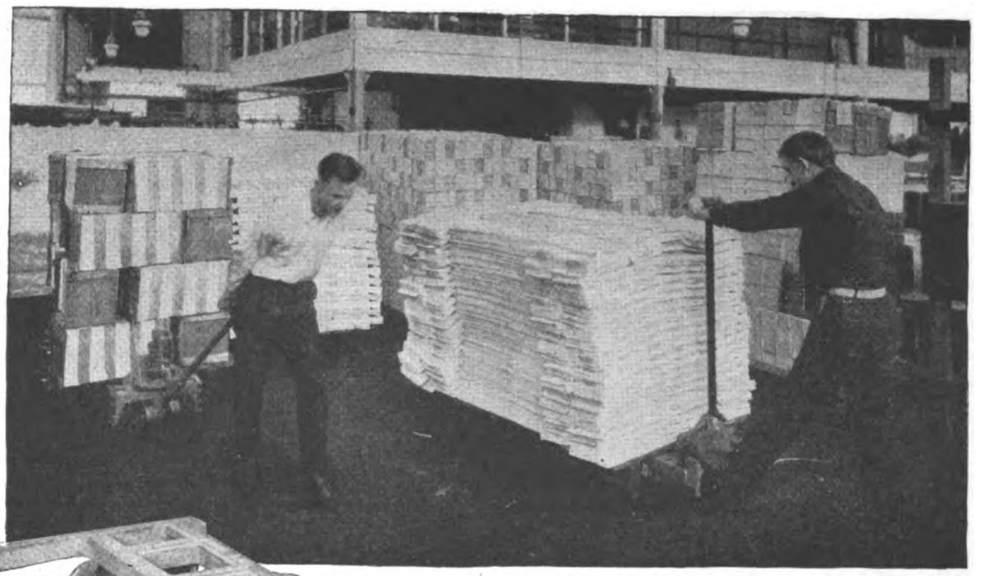
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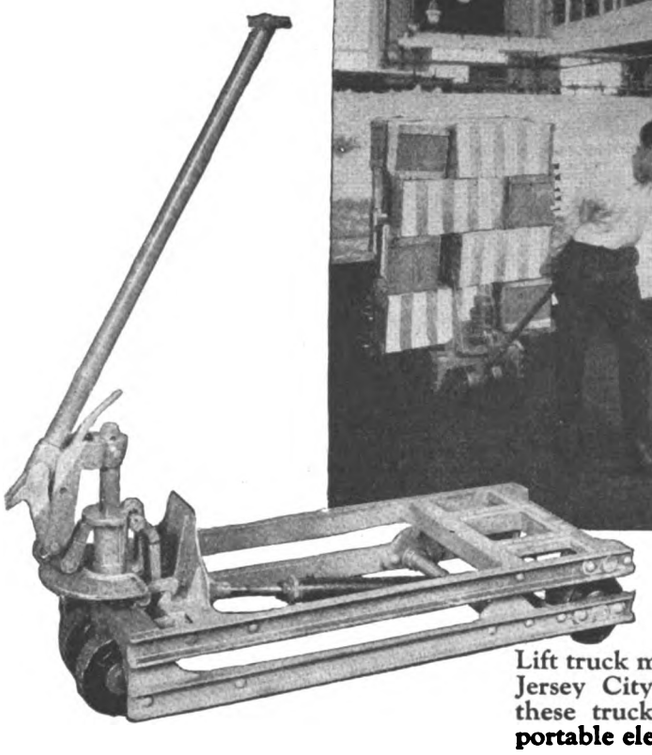
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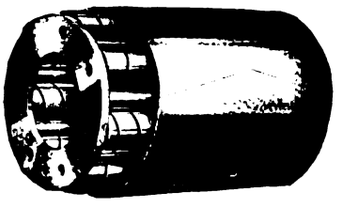
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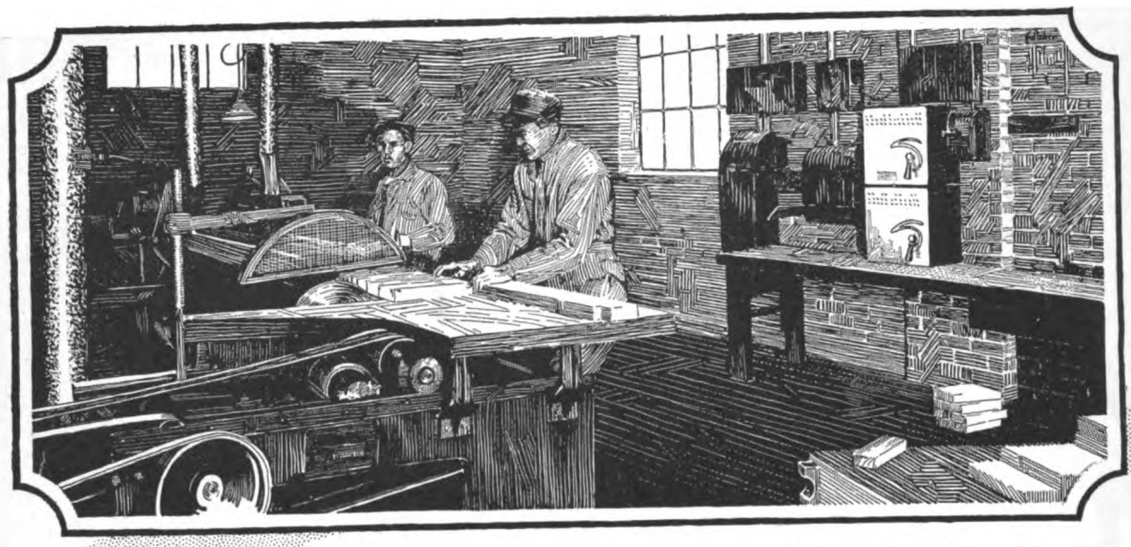
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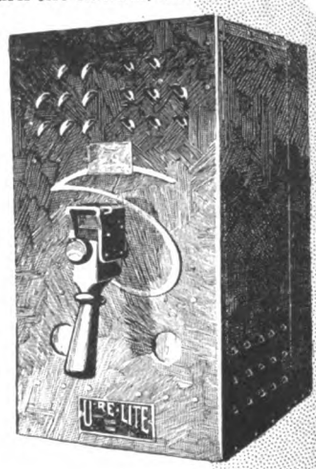
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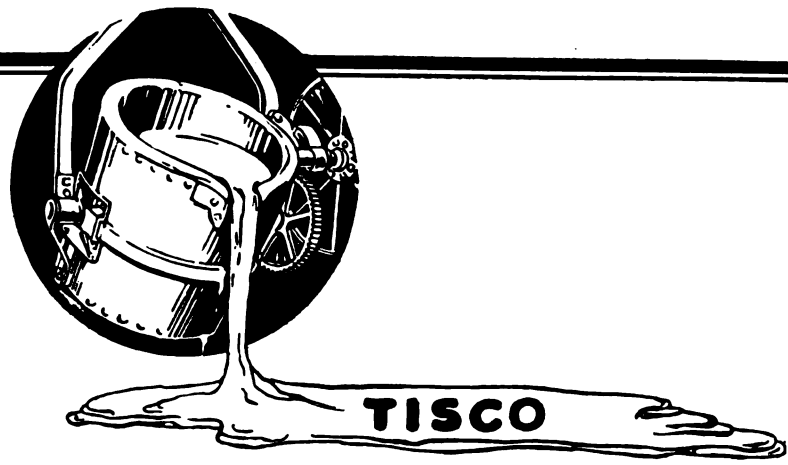
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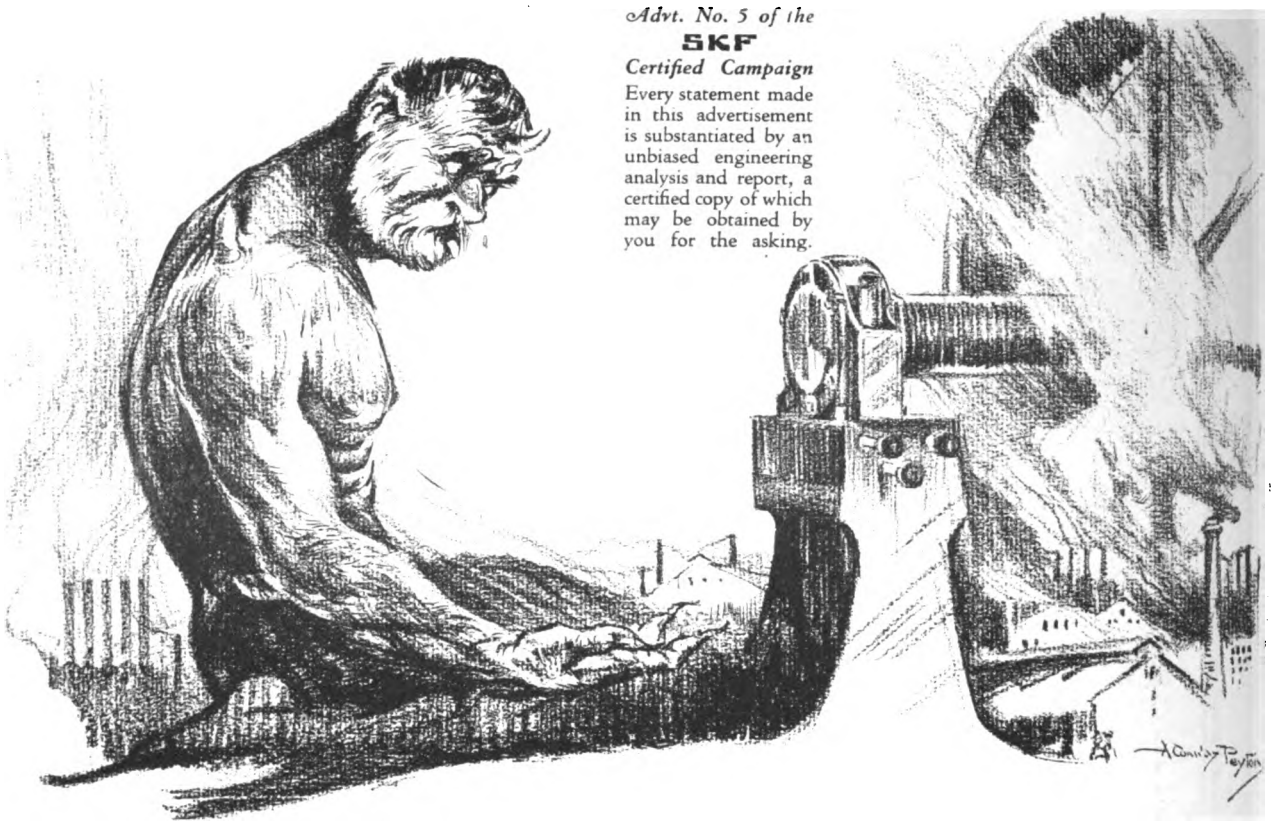
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MAY, 1925

Industry Illustrated

The Pictorial Presentation of Practical Management

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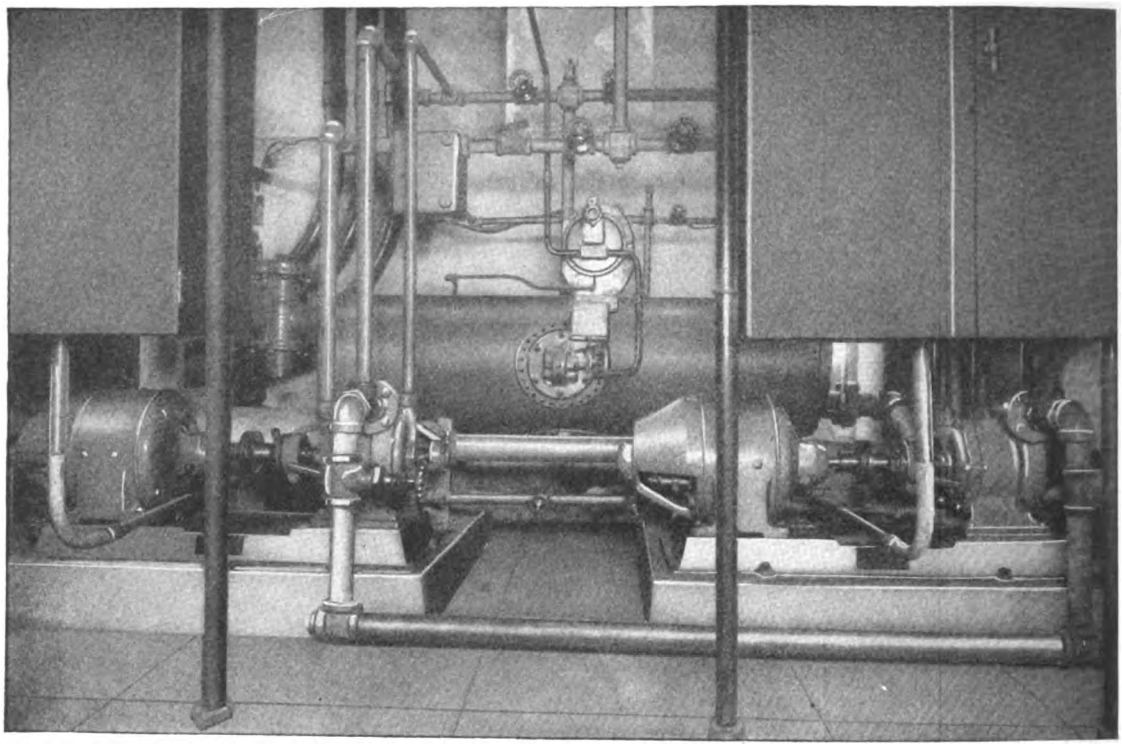
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Editorial

Nails and Kingdoms

Most of us remember those often quoted lines:

"For lack of a nail, the shoe was lost;
For lack of a shoe, the horse was lost;
For lack of a horse, the rider was lost;
For lack of the rider, his kingdom was lost."

We remember them, occasionally quote them; but how many of us apply the lesson to our daily routine?

That grinding wheel, which must keep the cutting tools in shape; grant that it is of the very best possible quality, yet, fail to keep it properly trued, and it becomes not only inefficient, but dangerous. The belt which drives it must not falter; yet the belt itself is dependent upon its lacing.

And so it goes, all through the shop. The very best pipe line for steam or air or water can be put out of commission by a single defective coupling, elbow or valve. The most accurately aligned main shaft can be made useless by a single stripped thread on hanger box, coupling or clutch.

Each one of you, in his sphere, has responsibility for an industrial "kingdom"—be it a whole plant, a shop, or a department. And the functioning of that kingdom is dependent, in the last analysis, upon the service of those seemingly insignificant "nails" —the bearings, couplings, belt lacings, studs, packings, and so on, whose failure means shut-downs and delays.

These things, in the modern industrial plant, are not merely matters of maintenance. Proper maintenance is important, but even the best maintenance department is dependent upon the quality of the equipment it serves. "Cheap" equipment means expensive maintenance; buying supplies on a price basis may be "smart," but it is always costly in the long run.

Look behind the price tag:—if it seems high, what makes it so? Quality always costs more to produce; and always *costs less to use*. Learn to look for quality, first; for price, only when assured of quality. The nail that lost a kingdom may have been a cheap nail—it probably was; but it turned out to be the most costly nail in history.

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What British Industries Are Doing for the Workers

By James F. Whiteford

REVIEW of industrial conditions in Britain discloses a general appreciation of the necessity for careful consideration of the human factor. During the latter days of the war, and especially during the subsequent period, welfare work developed upon a large scale. While the details vary somewhat, the general line of development and scope of the work is quite similar.

Welfare is now a definite feature in factory administration and management, an accepted institution in British industries. And Emerson's "An institution is the lengthened shadow of a man" is exemplified. Present developments are the result of the foresight, the patience, and the persistent efforts of the industrial executives who realized the need far in advance of the others.

These pioneers had much to contend with, for criticisms were directed from all sides. They were accused of paternalism, of attempting to counteract the influence of the trades unions, of masking advertising under the cloak of philanthropy. In these respects the experiences of the industrial managers of Britain and America are identical.

When medical examination of applicants was first instituted, it was regarded as an infringement of the personal liberty. When dental clinics were added



Fig. 1. Cookery instruction for girl employees, at the Chiswick Polish Company, Ltd.



Fig. 2. Boston House, nearly 200 years old, is now the recreation clubroom for girl employees of the above firm.

Fig. 3. Below—an artisan class in the Day Continuation School, Thos. Firth & Sons, Ltd., Steel Manufacturers.



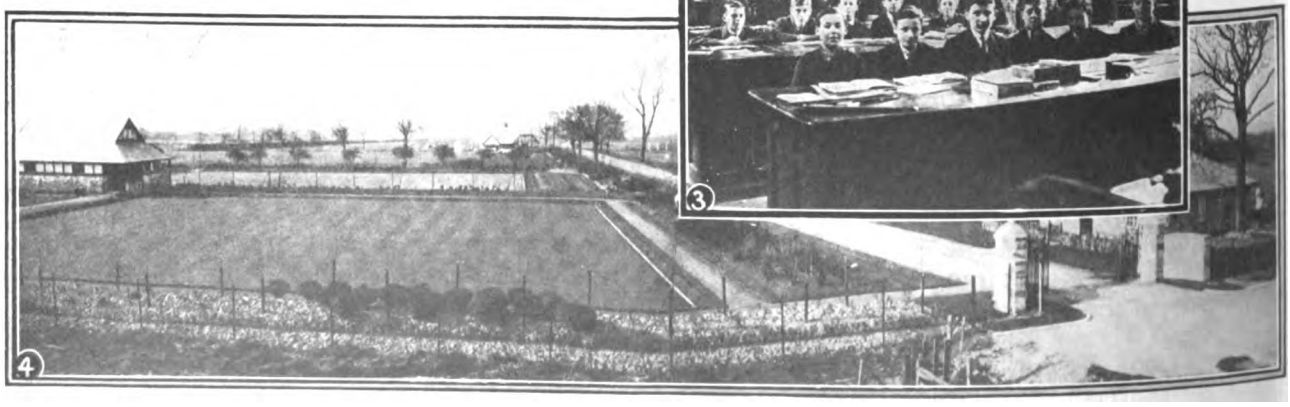


Fig. 4. A view of the recreation grounds of Smith's Dock Company, Ltd.

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to the factory equipment, there was great difficulty in securing the coöperation of the employees. In both instances, there was decided opposition, if not antagonism, on the part of parents where children under the age of 18 were concerned. And when these difficulties were overcome, there remained the criticism of the less progressive employers who regarded these innovations as unnecessary expenses, and of the professional agitator who contended that the cost of these developments would have served a better purpose if they had been converted into wages.

But these pioneers realized that workpeople are interested in other things besides wages—a fact that is not yet fully appreciated by all employers nor comprehended by the leaders of labor. Neither is it understood by those reformers who advocate the return of the guild system as the cure of the industrial ills. While welfare work is an accepted feature of industrial management, there are few who grasp the full scope and significance of the movement.

The ramifications of industrial organization have necessitated collective action in many matters and no phase of the welfare development has attempted interference in this respect. But while the identity of the individual is lost in this manner, the whole trend of the movement has been to protect and develop

(*Continued on page 81*)

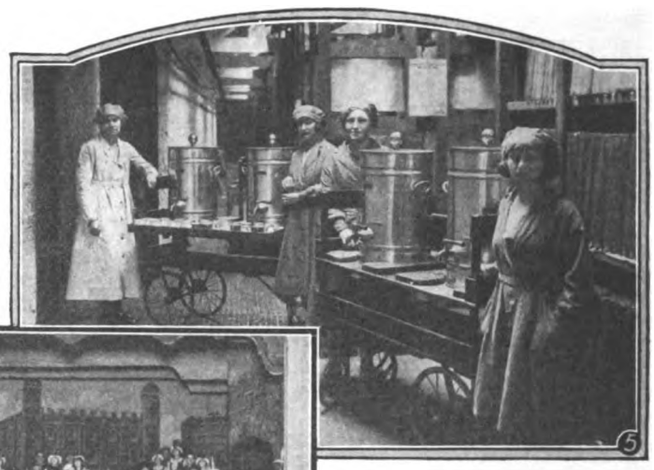


Fig. 5. Serving tea to factory employees during the ten-minute morning rest period, Hudson Scott & Sons, Ltd., Color Printers.



Fig. 6. Employees of the London Midland & Scottish Railway present an amateur performance of "Yeomen of the Guards."

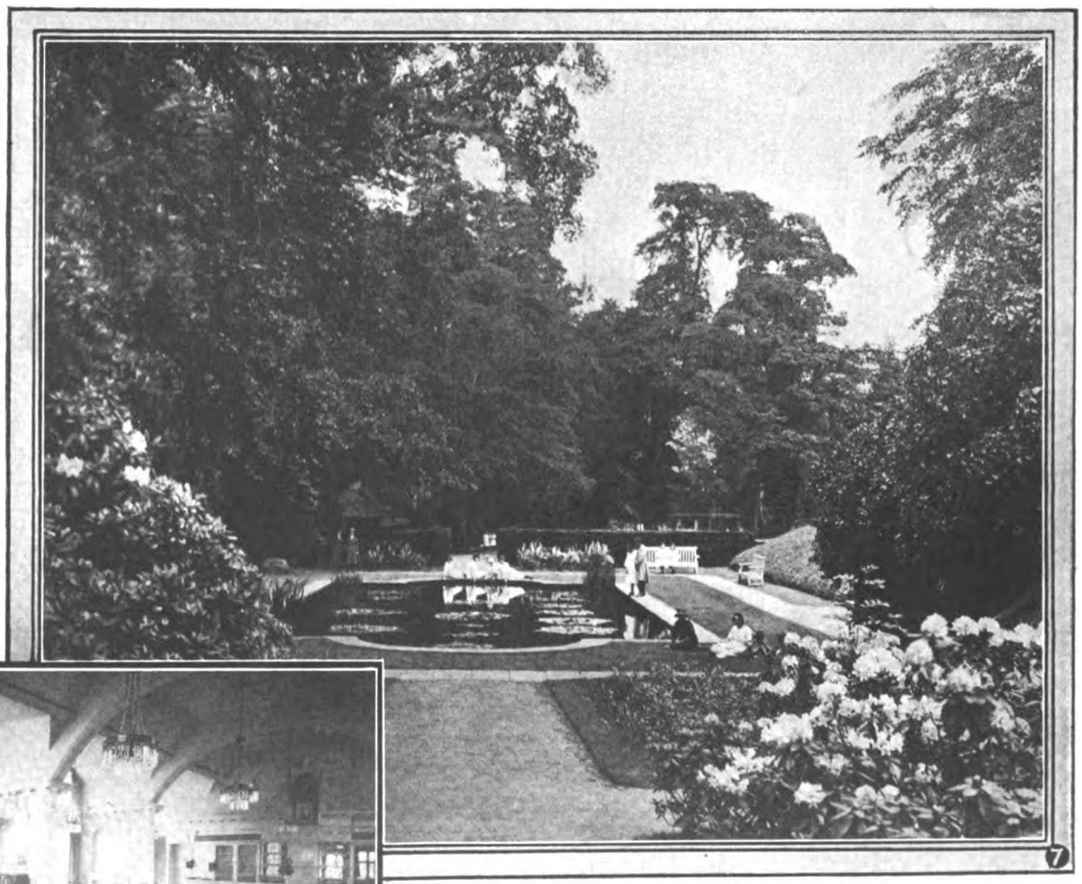


Fig. 7. Above—Part of the girls' recreation grounds at Cadbury Brothers, Ltd., Chocolate Manufacturers.



Fig. 8. Auditorium of the recreation clubroom for employees of Boots, Ltd., Manufacturing Chemists.

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How Do You Buy Belting?

Factors to Consider Ahead of First Cost

By Frank Edwards

TRANSMISSION belting has one function, is subject to two operating conditions, and is governed by three chief mechanical factors. Add to this the fact that it is made in hundreds of different ways and of different materials, and you get some idea of the considerations involved in buying belting.

The one function of transmission belting is to transfer power from a driving shaft equipped with a pulley to a driven shaft, likewise equipped with a pulley. The two operating conditions have to do with the way in which that power is applied; in the one case it is a steady, smooth pull, and in the other a series of short, jerky, momentarily interrupted pulls. And the three mechanical factors governing the belt are the drive, or energy imparted to the belt by the power of the driving shaft, the load, or resistance of the driven shaft plus the weight of the belt, and the pulleys themselves.

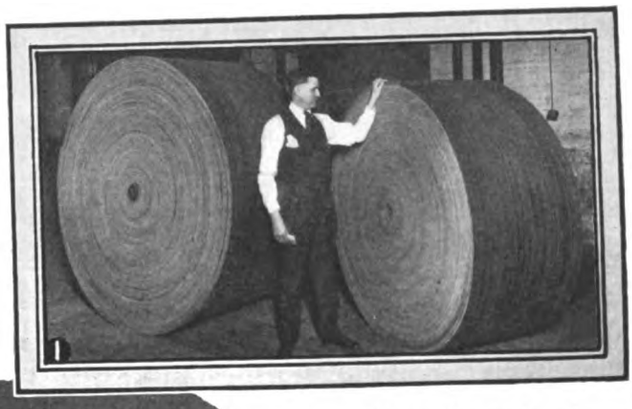


Fig. 1. Two belts of the "draught horse" type, 36 in. wide. Now installed at a gold mine in Alaska.

The two operating conditions and the three governing factors determine the *type* of belt to be used; the *kind* of belt used being largely a matter of judgment. The type depends solely on whether the pull is smooth and steady or jerky and spasmodic, while the kind of material used may be leather or a composition of woven fabric and rubber.

A jerky pull is usually due to the function of the driven machine. For instance, a circular saw, or a planing machine will "bite" into the work with vigor, and thus increase suddenly the pull on the belt as compared with the period when the machine is running free. This sudden application of increased power, or negatively put, increased drag, tends to stretch the belt. In consequence the belt must be elastic, to prevent undue strain on the driving machine, whether it be electric

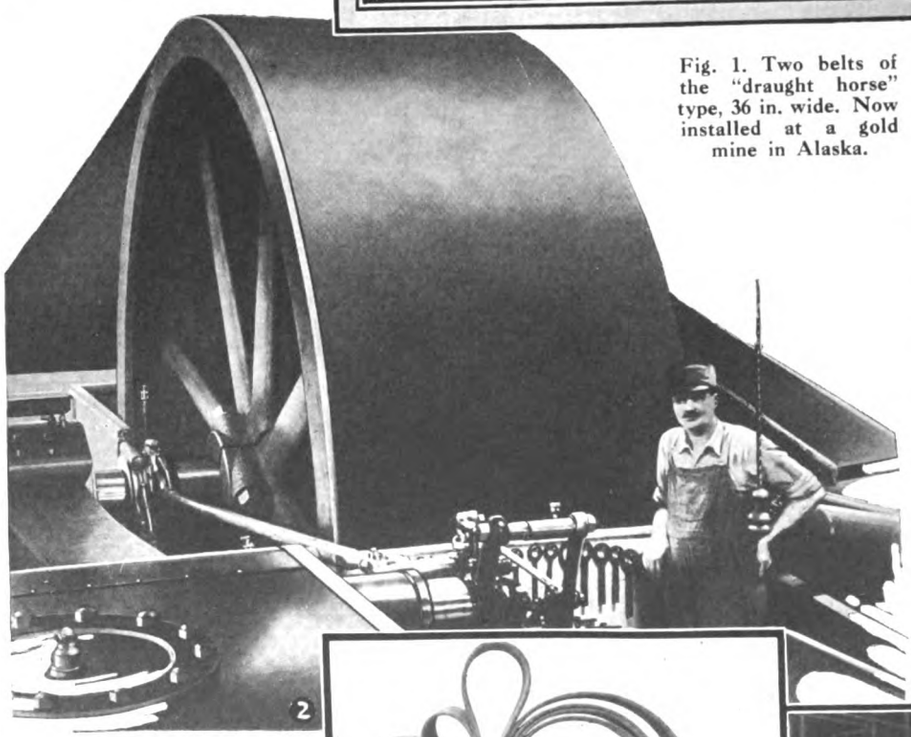


Fig. 2. A 60 in. wide main drive in a Kalamazoo paper mill. Belt is 131 ft. long and runs at a speed of three-quarters of a mile a minute.

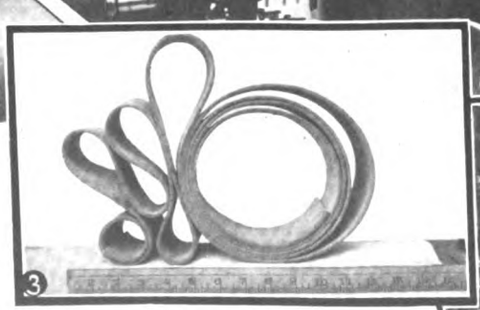
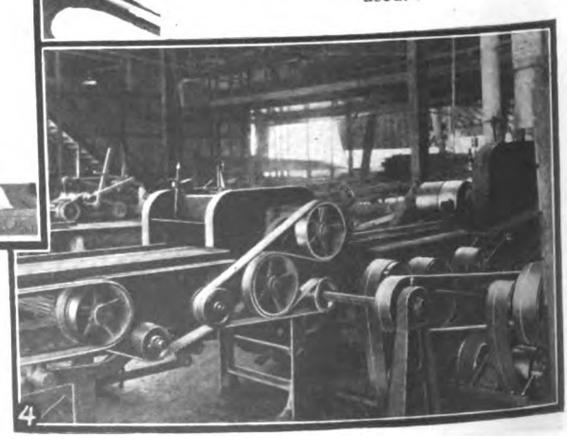


Fig. 3. A typical light, "race horse" type of belt. Note the extreme flexibility—a necessity for short drives at high speed.

Fig. 4. Scene in a Florida lumber mill showing the conditions under which light, flexible, high-speed belts are used.



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motor or steam or gas engine. Yet the feature of elasticity is not the primary consideration, else a belt of pure rubber would suit this condition best of all.

Pure rubber is not inherently strong enough to transmit power. It may easily be stretched so much that it will break. Hence, when used at all in belting, it must be combined with material of great tensile strength, such as woven fabric. But the character of this woven fabric in rubber belting depends on the character of the pull. If the pull is jerky, the fabric should be loosely and springily woven, for the sake of elasticity, whereas if the pull is smooth and steady, the fabric should be tightly woven, since elasticity is not required.

Leather is not very elastic, and consequently many engineers prefer a rubberized fabric belting for service where the pull is jerky. On the other hand, there is probably no other material which will attain such long life and give uniformly satisfactory service where the conditions require smooth, uniform transmission of power under practically steady load.

That belt is the most satisfactory which in the long run will transmit the desired power at the lowest total cost. Bear this point in mind—the lowest *total* cost. The cheapest belt in the long run is not

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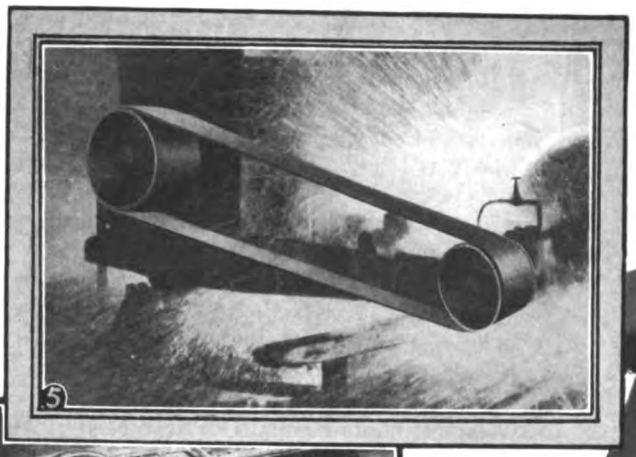


Fig. 5. A spectacular belt drive in a Philadelphia steel works. This 10 in. wide belt transmits 30 hp. to a hot metal saw, running at 5,654 ft. per min.

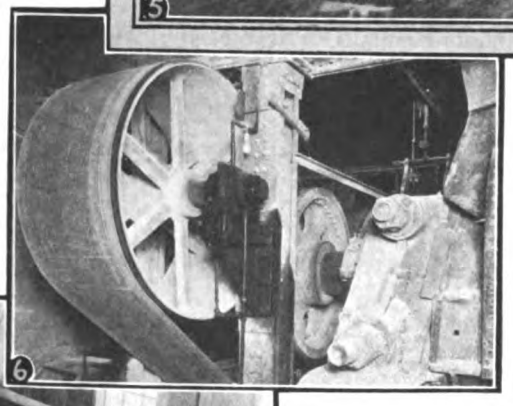


Fig. 6. A fine example of a heavy belt is shown in this stone crusher drive located near New York.

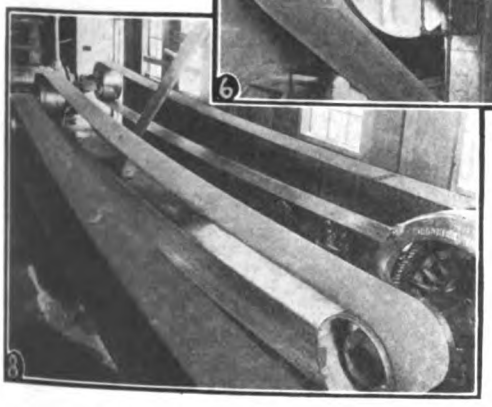


Fig. 8. Three 12 in. belts driving pulp grinders in a California paper mill.

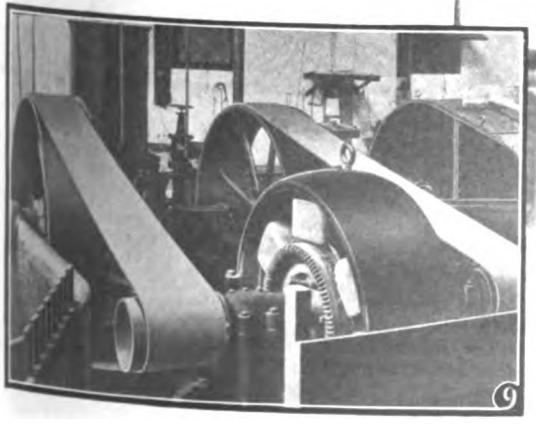


Fig. 9. Two beaters are driven from one motor in this Ohio paper mill. The tension in both 17 in. belts is taken up evenly by adjusting the sliding base of the motor.

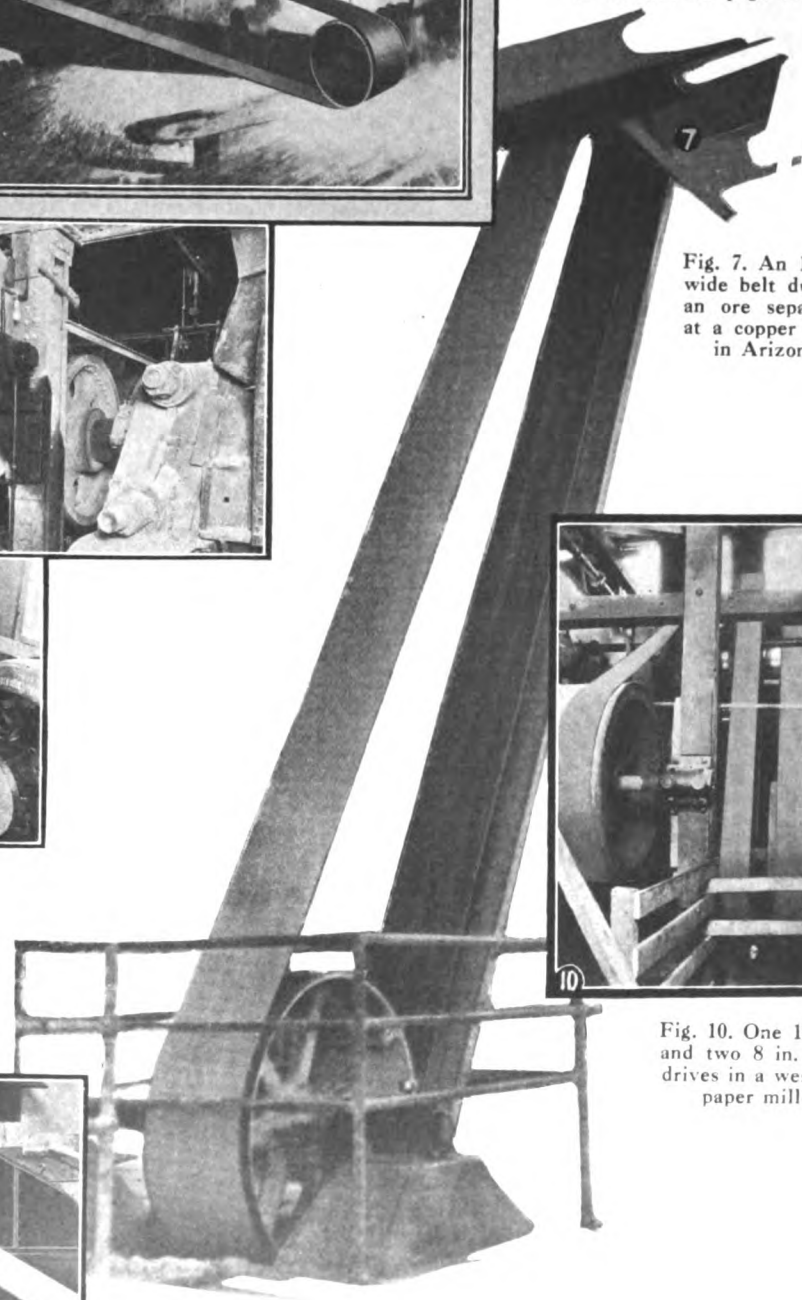


Fig. 7. An 18 in. wide belt driving an ore separator at a copper mine in Arizona.

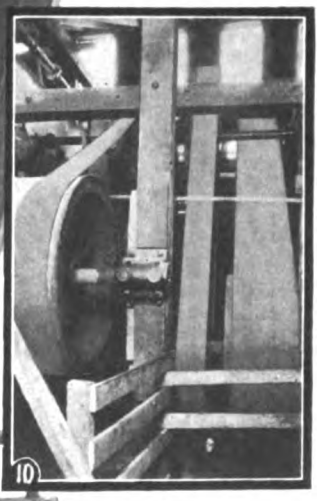


Fig. 10. One 18 in. and two 8 in. belt drives in a western paper mill.

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Industry Crosses

Manufacturing Invades the West to

By John

FOR one hundred years mighty nations and strong men have built the great industrial civilization of the Atlantic scene. Napoleon was scarce on his way to St. Helens when keen British and American traders and European artisans were bending to the race for wealth. King Coal and humming machinery were enlisted. Liverpool, New York, Hamburg, Havre mothered rich argosies of a world's unfolding wealth.

Great mountain chains encircle the vast kingdom of the Atlantic and encourage its own distinctive nature. The Ural ranges of Russia divide East and West; the Alps separate pine and olive tree; below the Pyrenees lies the Mediterranean spirit; the Andes of South America wall in the East; and on our own Rocky Mountains is The Great Divide between the Atlantic and the Pacific.

Down to the Atlantic from all these granite slopes flow the world's great rivers of commerce, the Rhine, the Seine, the Thames, the Elbe, the Hudson, the Mississippi, the Amazon,



Fig. 1. Beautiful Mount Rainier, near Tacoma and Seattle, typifies three Western advantages—unparalleled beauty, preserved in national parks, perpetual water-power, and accessible recreation.

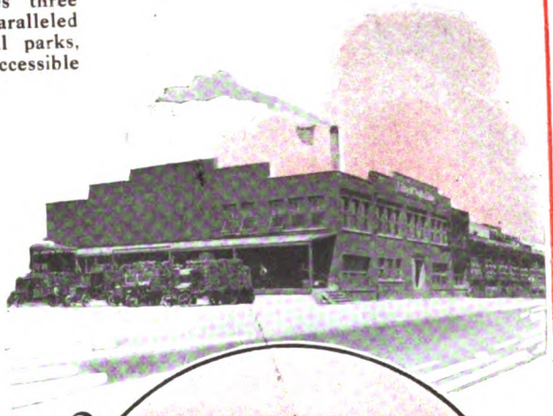


Fig. 2. Packing and canning of all sorts increases as the West's agriculture expands. To this great plant of Libby, McNeil & Libby, at Sacramento, spinach and myriad fruits are brought from fertile California valleys.

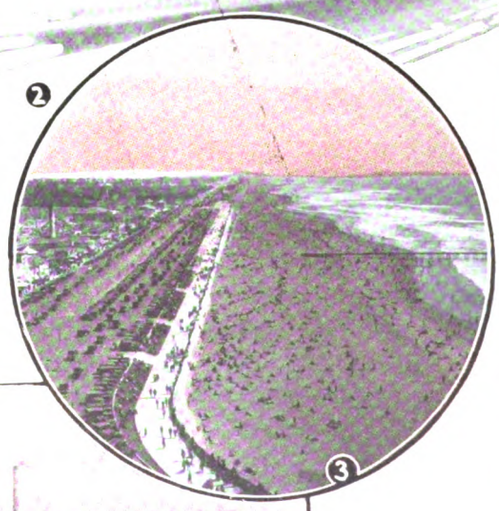


Fig. 3. A San Francisco beach on the wide Pacific. The great rise of Oakland, across the bay from Frisco, as a manufacturing area, is due in part to the fine living conditions in the area for workers.

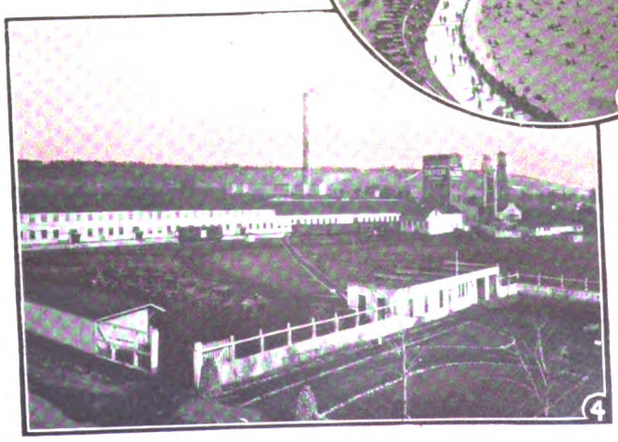


Fig. 4. A growing paper and pulp industry near great forests, power and water transportation. The Inland Empire Paper Company, at Spokane, Wash.

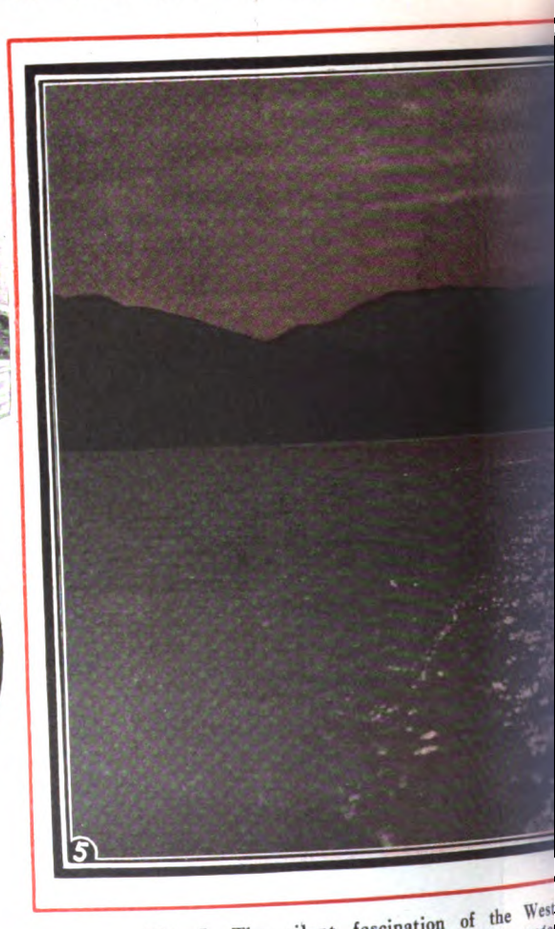


Fig. 5. The silent fascination of the West Sunset on Roosevelt Lake among the ranges of Arizona.

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The Great Divide

Help in the Making of the Pacific Empire

A. Piquet

carrying to the central sea the crops and manufactures of the multitudinous peoples of Atlantic lands.

For ten thousand years far Pacific countries have slumbered, lapped into dreams by an azure ocean, on whose shores the sun never sets. Neither a sleeping Orient nor savage Australasia or the Western Americas, knew what inimitable treasures filled the earth on which their inhabitants but existed. From the Atlantic nations only a handful of traders felt the pulse of a surging future. America, busy with the pomp and ducats of the industrial East, visioned beyond the Rockies but an untamed West, barred by impenetrable mountains.

Only the pioneers, silent bearers of the torch of progress, pressed on over the ominous hills. On sage-brush plain and through canyon walls they established outposts of civilization, and with faith and hope staked out the promised land.

"We pitched our tents where the Buffalo feed,
Unheard-of streams were our flagons,
And we sowed our sons like the apple-seed,
In the trail of the prairie wagons."

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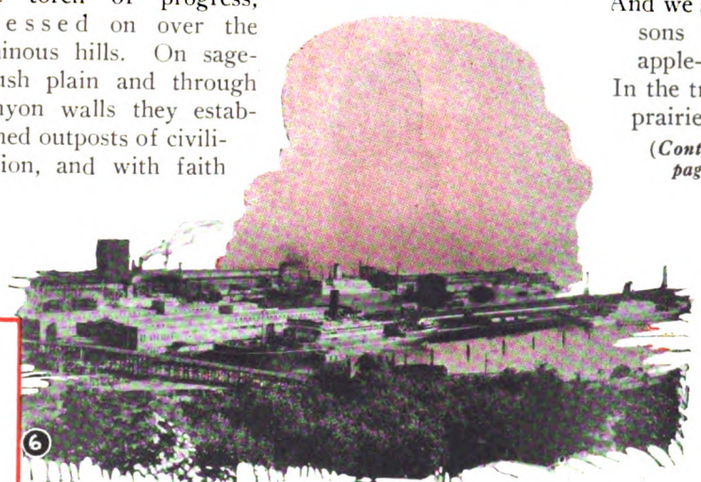


Fig. 6. Pacific ports ship cheaply to the Seven Seas. The gigantic municipal docks at Seattle, 3,000 feet long, connecting with railroads, and holding seven ocean steamships at a time.

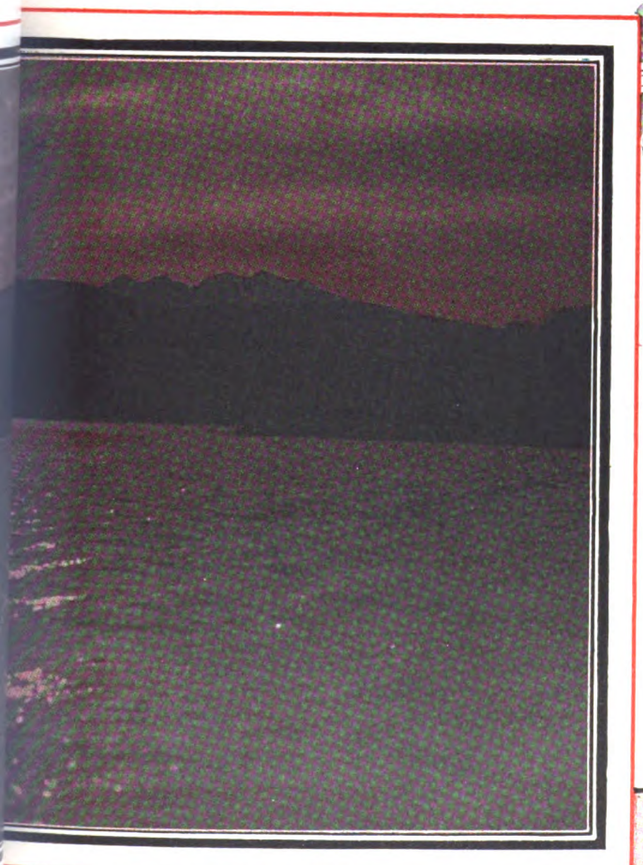


Fig. 9. This active coal mine in Alaska on the new government rail system is an example of the opening to private initiative of that country's great fuel, power, mining, fishing, lumber, and agricultural opportunities.



Fig. 7. Some of the country's best woolen goods are now made in the West, where the sheep are. The Portland Woolen Mills at Portland, with the workers' cars lined up in front. No slums here.

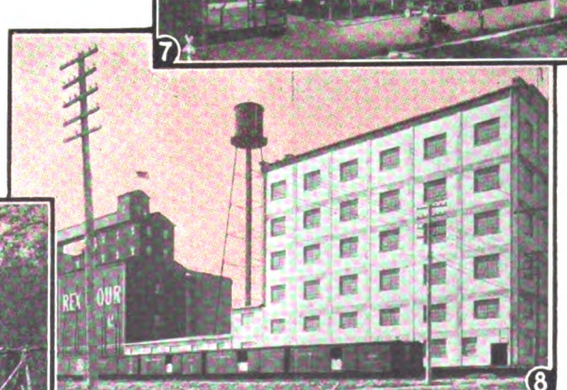


Fig. 8. Food-products of many kinds offer increasing opportunity to manufacturing in the West's grain and live-stock areas. One of the flour mills at Great Falls, Montana, a growing city near water-power, agriculture, mining, and animal raising.

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American Handling Methods in Far-Off Siberia

Problems Encountered in Installation

By Matthew W. Potts

IT is interesting to note that while executives and municipalities in this country are considering the advisability of installing materials handling equipment, some executives, and governments of foreign countries are taking action, and purchasing their equipment from this country for installation abroad. This is a true indication that the labor market, the so-called common labor shortage and the cost of labor are not the only important factors in determining whether or not it is advisable to install materials handling equipment. From the following it will be noted that the questions of production, speed, convenience and reliability have a great bearing on the decision.

Recently the writer had the privilege of reviewing a report sent to this country by A. J. Mandehr, who is the erection engineer for an American company, which built and installed conveyors for the Chinese Eastern Railway on their docks at Eggersheld, Vladivostok, Siberia. The photographs used in this article were a part of this report, and give a clear presentation of the type of labor employed and the equipment installed. The report is also interesting for several other reasons. It gives information in a very concise form on the conditions which an American erector has to meet in foreign countries. In the body of the report, many notes are made calling attention to difficulties encountered in the field because of minor shop errors, and also the amount of extra work required in the field to correct these errors. To give the entire report would require more space than is available, so we present it in a summary form.



Fig. 1. A typical Dock Walloper of Russia, used for the transportation of material.

There is one term used in the report which might possibly confuse the reader. This term is *"godowns."* The origination of this term is due to the English-speaking people talking to the Eastern natives. These people used to say to the natives: "Go down to the shed and bring me the material" or "Go down to the dock and get me Mr. Jones," and the resulting term *"godown"* therefore has



Fig. 2. Method of transporting bag materials from docks to "godowns" by means of man power.



Fig. 3. General view of the stationary slat conveyors which pass from the water front through the various warehouses or sheds. There are six of these in all.

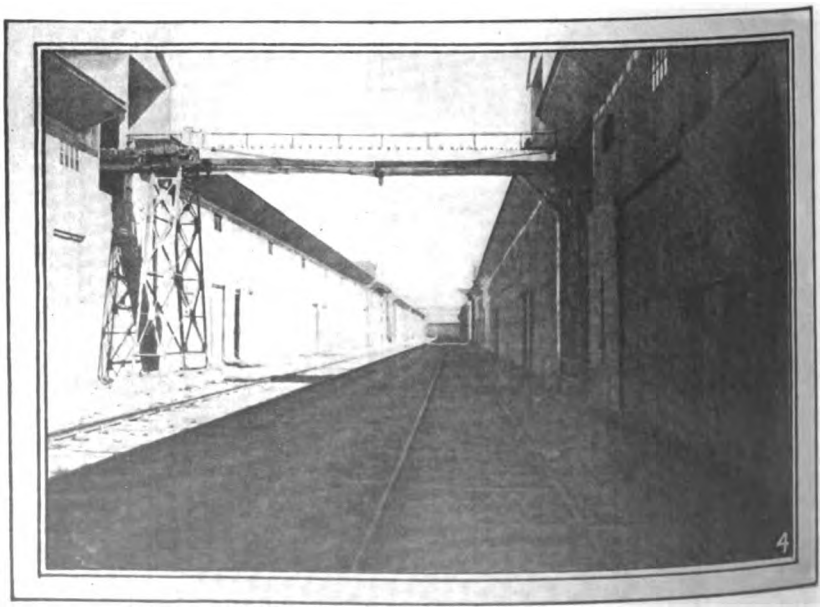


Fig. 4. General view between warehouses or sheds showing how the conveyors bridge the railroad track.

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come to signify a storehouse or place where something might be kept. It also refers to the sheds and warehouses mentioned in this article.

To give an idea of the problem, at Eggersheld, we will enumerate some of the materials handled, their character, and the line of transportation. Most of the materials are received in barges or boats and are transferred to supporting warehouses or piers, where they are stored until ready to be reclaimed from storage, and placed in cars for rail shipment. Three of the largest commodities received at this port are beans in bags, bean cakes and salt. The following description will give the readers a clear picture of these commodities:

Beans in Bags.	(Soya Beans)
Character:	Sacked very firm.
Weight:	Approx. 200 lbs.
Size:	26″ x 35″ x 12″ (extremes)
Piling Height:	18′ to 20′
Line of Travel:	Boats to Warehouse. Cars to Warehouse. Warehouse to Boats.
Bean Cake:	(Soya beans with oil pressed out)
Character:	Very hard and oily, bruised edges, concave toward center, (never run flat)
Weight:	Approx. 70 lbs.
Size:	4″ Thick, 24″ Dia.
Piling Height:	12′ x 14′
Line of Travel:	Cars to Warehouse. Warehouse to Boats.
Salt:	(Coarse grain)
Character:	Packed very firm.
Weight:	Approx. 216 lbs.
Size:	26″ x 36″ x 12″ (extreme)
Piling Height:	18′ x 20′
Line of Travel:	Boats to Warehouse. Warehouse to Cars.

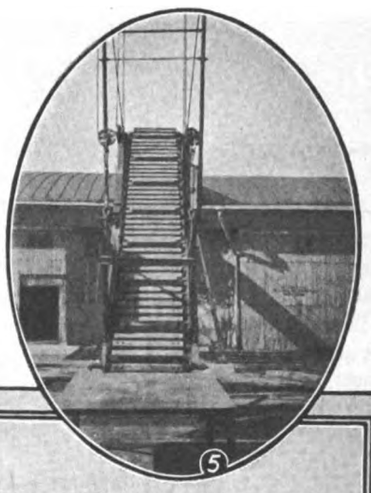


Fig. 5. Inclined slat conveyor elevator resting on floating dock. This conveyor transports the materials to and from the warehouses.

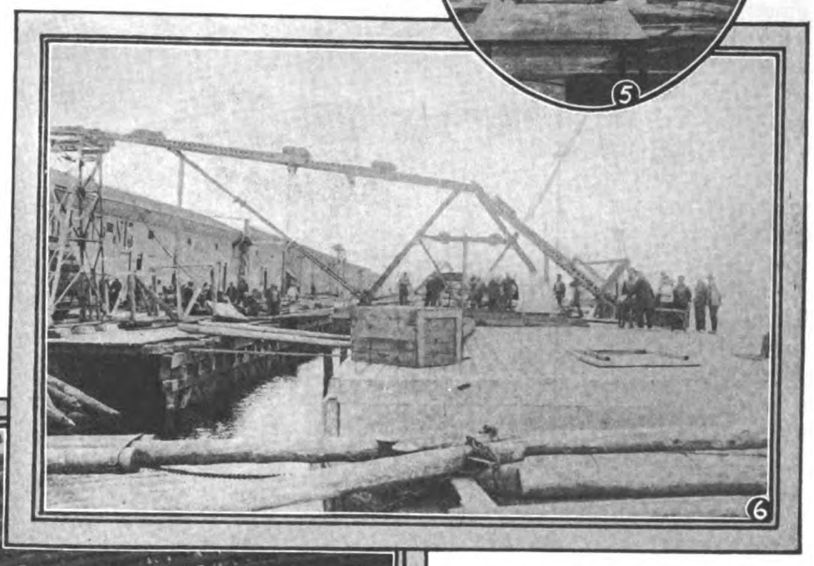


Fig. 6. Side elevation of the conveyor shown in Fig. 5. This shows how the conveyor on the floating dock connects with stationary conveyors on the bulkhead, thus forming a link between warehouses and boats.

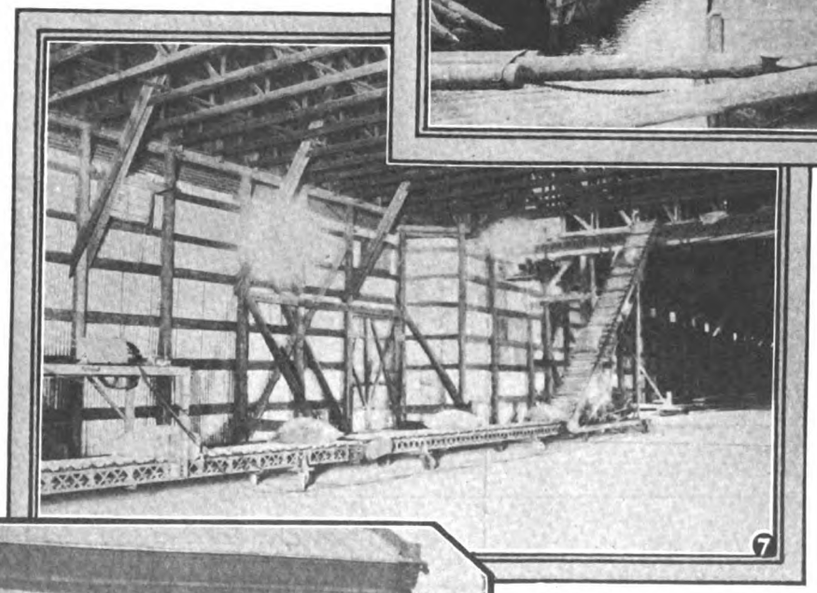


Fig. 7. Interior of warehouse or "godown." This shows the method of taking bags out of the warehouse, and elevating them to the overhead conveyors for delivery to cars or boats.



Fig. 8. General view of the old hand method of handling incoming materials. The men in white uniforms are checkers and custom inspectors.

Figs. 1 and 8 show the hand method of transporting the bean cake, while Fig. 2 shows how salt and beans in bags were handled by man power.

Conditions at Vladivostok are somewhat similar to those prevailing in our own American ports, namely that the stevedore unions at present control all dock labor and, therefore, are more or less in a position to dictate the type of materials handling equipment that will be installed. This is one reason why our American ports are not more mechanically equipped. Therefore this report is timely to show what the Russian government, in connection with the Eastern Chinese Railroad, is doing to meet a similar condition, under even more

(Continued on page 89)

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Air: Our Mos

Proper Combustion Depen

By Fran

DO you realize that the whole problem of obtaining furnace efficiency in the power plant is reducible to this one, all-important question: "How can *air* be burned more effectively?"

While the average power plant engineer may not consider this statement entirely according to Hoyle, he will recognize the fact that it is near enough to the actual truth of the situation to warrant some serious thought on the qualifications of air as our most important fuel.

Combustion, insofar as this same engineer is concerned, consists of the *rapid* chemical union of the carbon and hydrogen in coal, gas or oil, with the oxygen in the air. The fuel must be raised to the kindling point for this union to be started, after which the heat generated by the process automatically keeps the fuel at or above the kindling point until the burning is complete, *provided air is fed to it properly.*

Notice the fact that the fuel in question furnishes two of the necessary factors of this chemical union (carbon and hydrogen), while air furnishes the third (oxygen). And this third item is by far the most important, because *oxygen is the only substance which will support combustion.* Many thousands of the substances in this world can be made to burn —slowly, as iron when it rusts, or rapidly, as gunpowder when it explodes— but each and every one depends solely upon the oxygen in the air for its ability

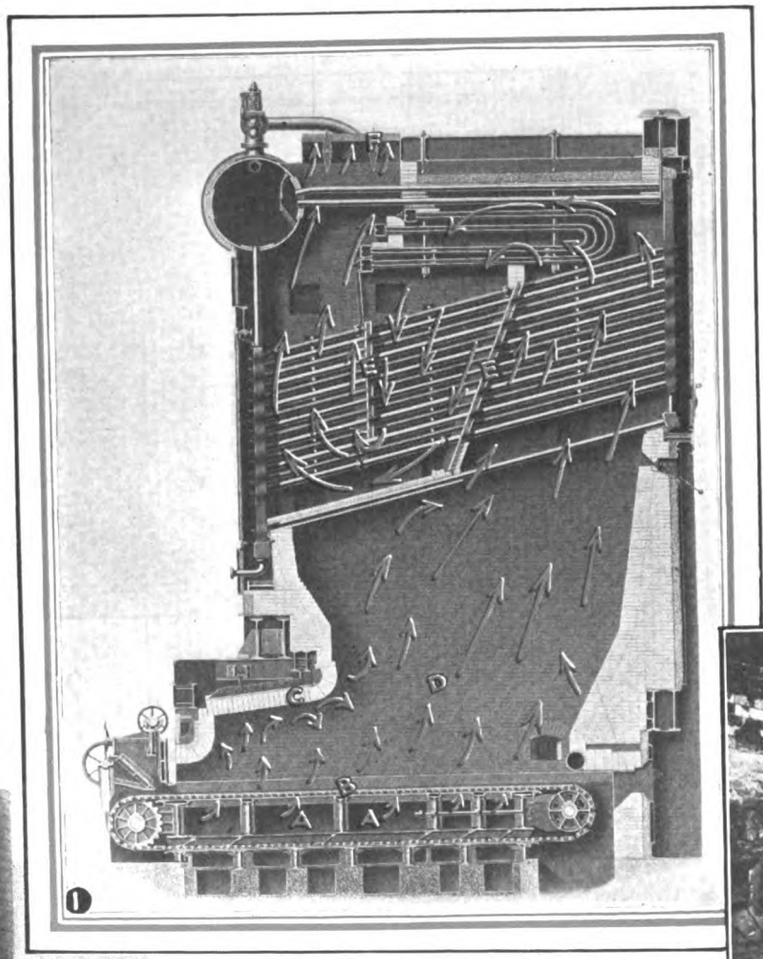


Fig. 1. A traveling chain grate stoker-fired water tube boiler, with forced draft. A, Wind boxes; B, Stoker grate; C, Ignition arch; D, Combustion chamber; E, Boiler tube baffler; E, Dampers.

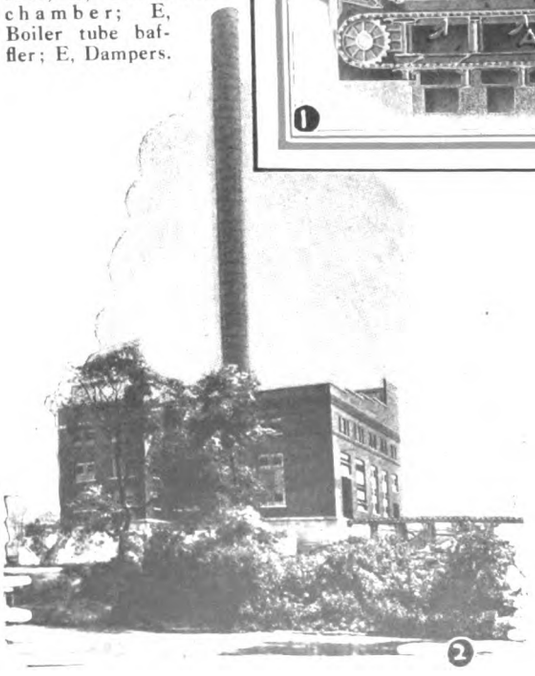


Fig. 2. The Marion station of the Columbus, Delaware and Marion Electric Company. A representative modern plant.





Figs. 5 and 6. The view above shows the condition of a hand-fired furnace after less than six months' operation. Notice how the ignition arch is burned and broken. The patching at the left will probably carry this furnace another half year.

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mportant Fuel

on Furnace Design

aschek



Figs. 3 and 4. Refractory cements bond into the wall best when they are applied in quite liquid consistencies. Tacking light wooden lath to the walls on 20" centers diagonally placed, holds the fluid mass in place until it sets. The lath are then removed, and the spaces left coated with cement.

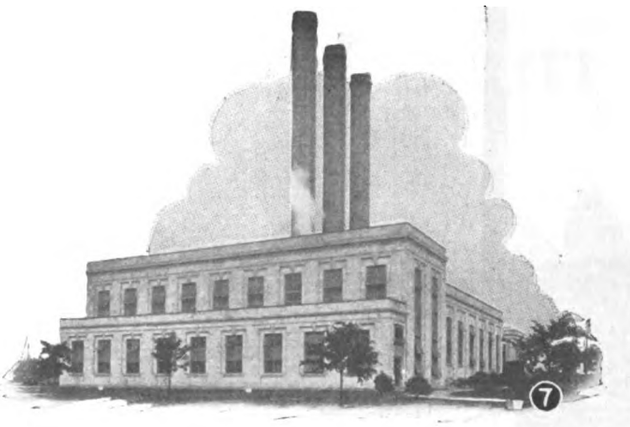


Fig. 7. Bennings station of the Potomac Electric Power Company, near Washington, D. C.

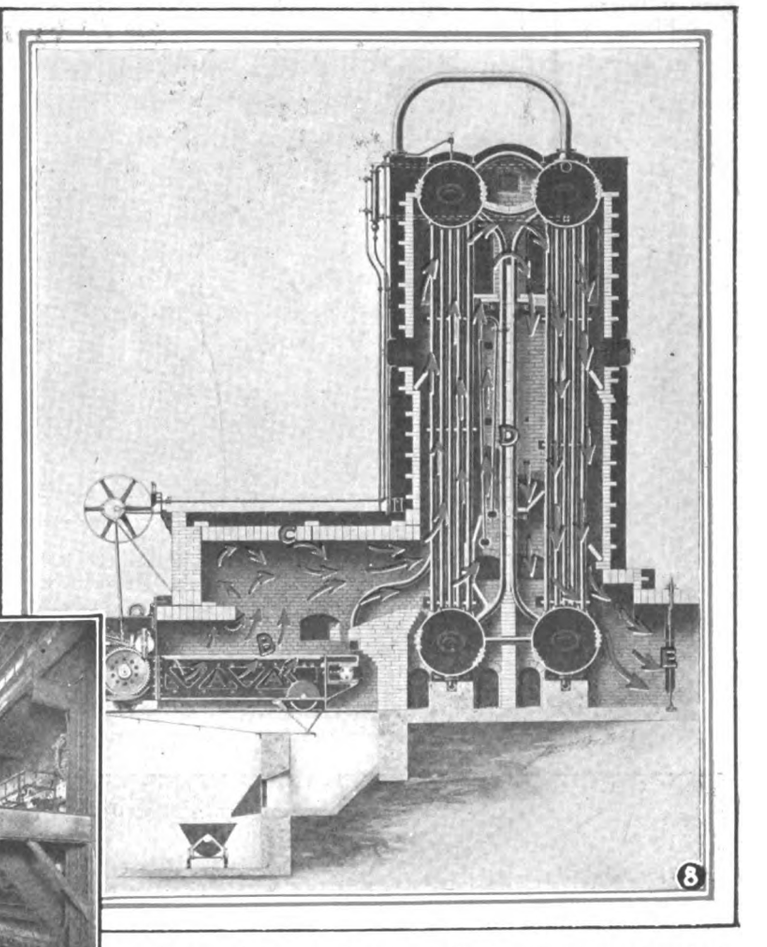


Fig. 8. A stoker-fired vertical water tube boiler. A, Wind chamber; B, Stoker grate; C, Ignition arch; D, baffles; E, Damper.

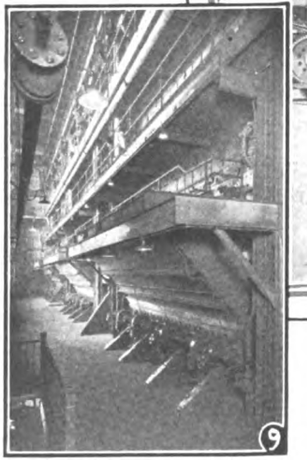


Fig. 9. A battery of huge boilers in a large central station where fuel is fed to the furnaces automatically.

to burn. The combination of oxygen with a substance is chemically known as "oxidation"—and in a sense, all oxidation is combustion.

But there is still another reason why air should be considered the most important of fuels, and that is on the basis of the volume of it required in burning any substance. Take coal, for instance, Mr. F. F. Uehling, a noted combustion engineer, has given this startlingly graphic illustration:

". . . in fairly good practice about 25 tons of air is used to burn one ton of coal, and in the more poorly equipped plants this amount is often doubled. Twenty-five tons represent a lot of air. Under normal conditions it occupies a space 16,000 times as large as the coal which it consumes. . . . If the floor of a room were covered with coal to a depth of one foot, the ceiling would have to be over three miles high for the room to contain as much air as is generally used to burn that quantity of coal."

On the basis of its necessary presence as an ingredient of combustion, and of the large volumes required to support combustion, air is undoubtedly our most important fuel. Yet, just because air is free, that is no reason why it should be mistreated. In fact, unless air is treated with the utmost consideration, it takes a very

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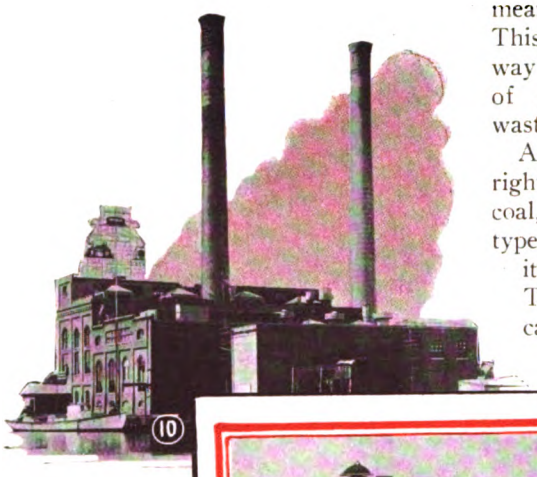


Fig. 10. Station of the Tampa Electric Company, at Tampa, Fla.

mean revenge in the power plant. This revenge is exerted in such a way as to cause many thousands of dollars' worth of loss in wasted heat.

Air must be used in just the right proportion required by the coal, oil or gas burned, *and* the type of equipment used to burn it, *and* the method of firing it. Too much air will result in carrying the process of combustion up into the chimney, where the heat evolved cannot be utilized; too little air will result in incompletely burned fuel.

The furnace of an industrial boiler may be likened to the carbureter on an automobile engine. Its real function is to mix the air and the gases of combustion so thoroughly that, then and there, every possible unit of realizable heat is yielded up to make steam in the boiler.

Three illustrations make this clear. The first shows a typical hand-fired water tube boiler. The combustion chamber is small, as the rate of burning, under natural draft conditions, is not high. The furnace construction is simple, the principal requirement being

(*Continued on page 70*)

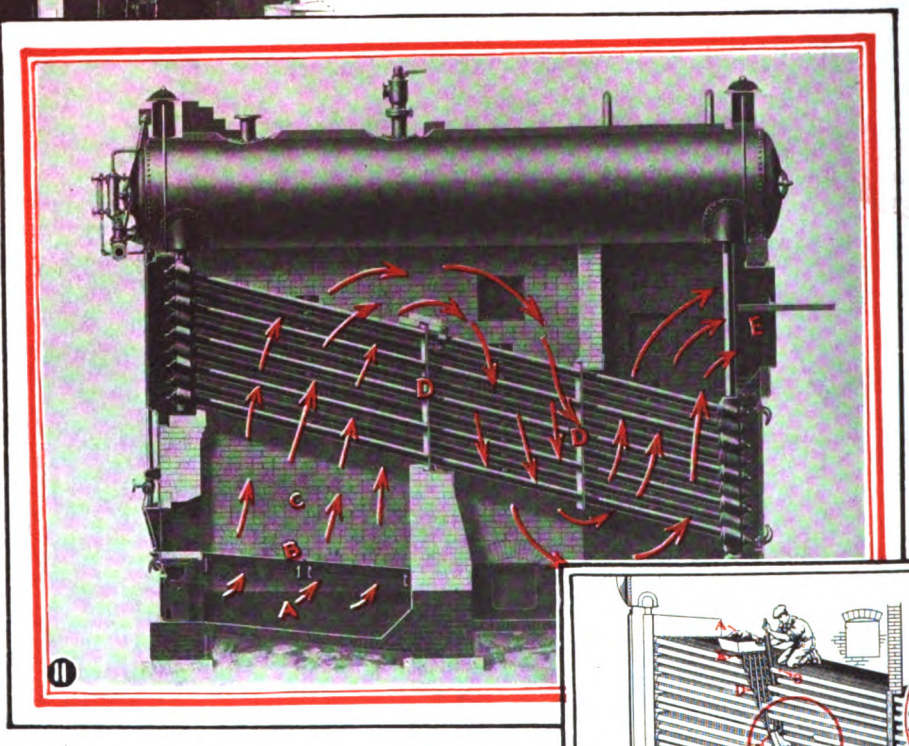


Fig. 11. A hand-fired water-tube boiler, with good height between fuel bed and boiler tubes, using natural draft. A, Ash pit, where fresh air enters; B, Grates supporting fuel bed; C, Combustion chamber, where gases burn; D, Baffle walls to deflect the gases; E, Damper, controlling the draft.

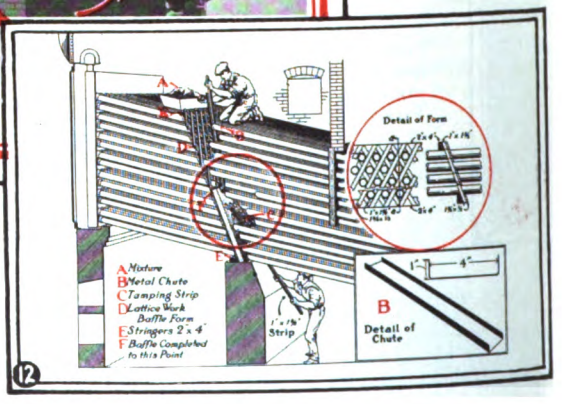


Fig. 12. A modern method of building boiler baffles. A light wooden lattice work is set in place, and the plastic material pushed into place against the lattice work and smoothed off. **The first fire sets the cement and burns out the framework.**

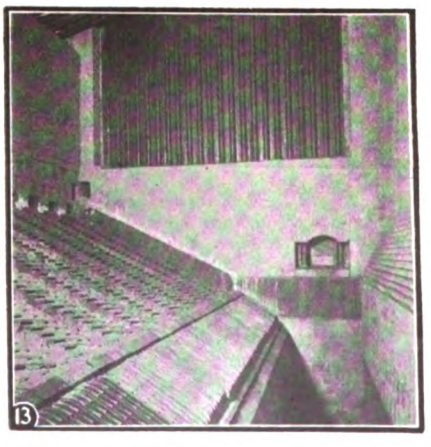


Fig. 13. Notice the size of this combustion chamber. This is a modern high-powered furnace equipped with an underfeed stoker.

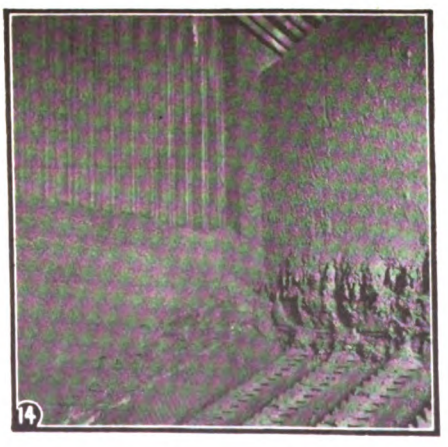


Fig. 14. The havoc created by fire. In this high-powered stoker-fired furnace, the surface of the walls has actually melted under the intense heat.

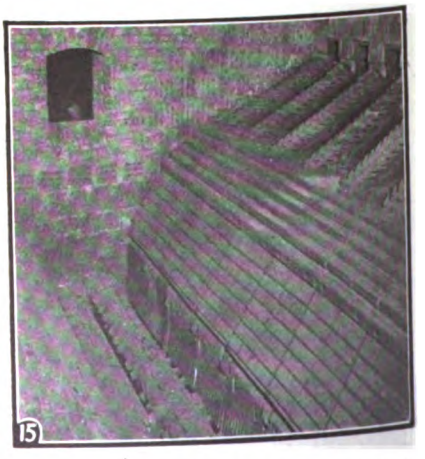


Fig. 15. A freshly rebuilt furnace side wall. Good construction is evident in the regular brickwork and in the ventilated blocks near the stoker.

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He's a Remarkable Executive —and No Wonder

Macauley Demonstrated Half a Dozen Capabilities, Any One of Which Might Have Carried Him to the Heights

By Dwight G. Baird

LEADERS in American industry spring from many sources and develop through many different channels, and a very large proportion of them—perhaps a majority—reach the heights because they excel in some one particular.

From the ranks of the engineers come some who have demonstrated exceptional creative ability, others who have established reputations as production men, and still others who have been outstandingly successful as leaders and developers of men.

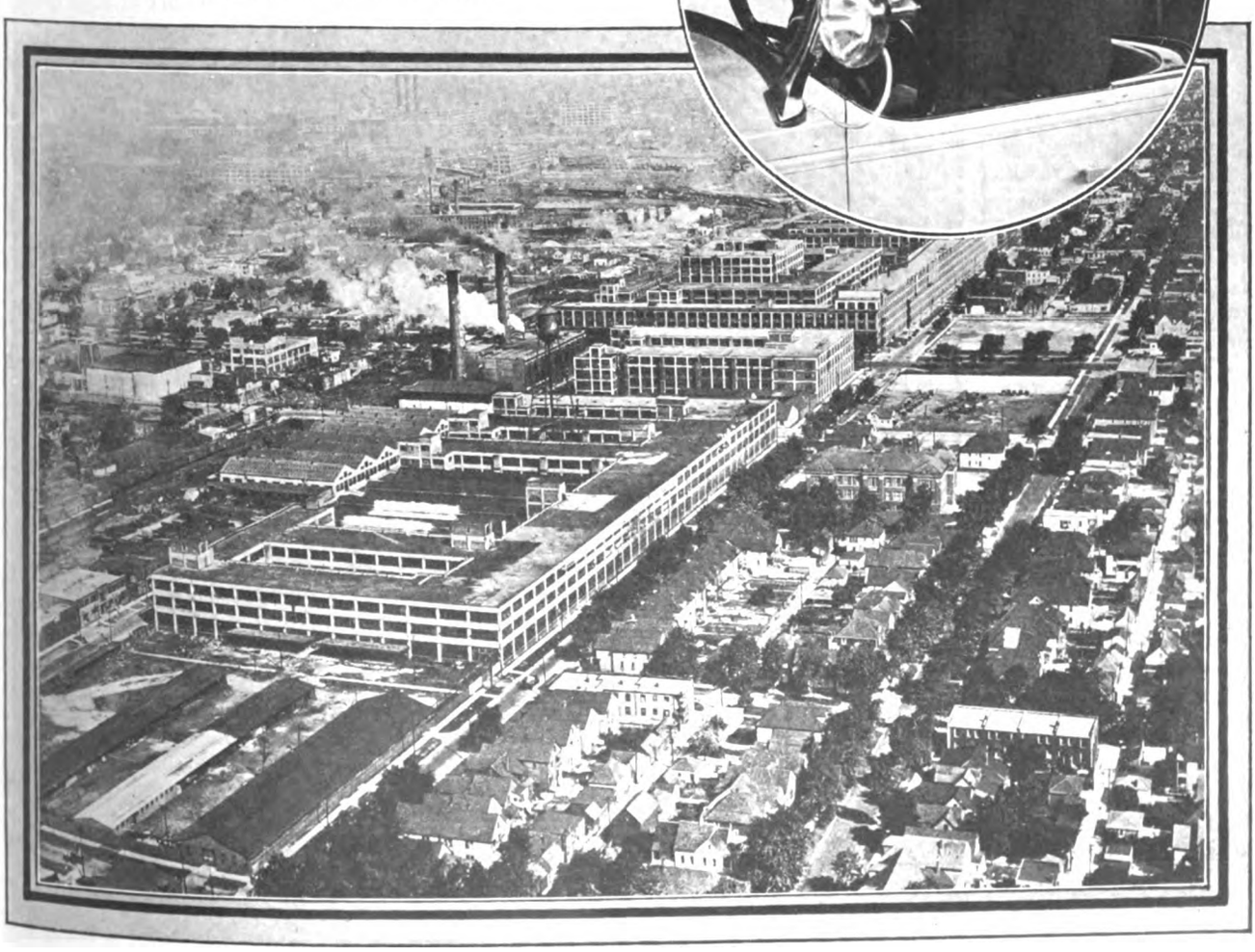
The master salesman may be chosen to head his company, the wizard of finance may be the favored one, and a rather surprising number come from the legal profession.

There is one outstanding figure in modern industry, however, who has advanced to his present position because he has been so versatile as to

(*Continued on page 58*)



Alvan Macauley, at the right—and, below, the plant of the Packard Motor Car Company, of which he is president. Mr. Macauley's career refutes the idea that, to succeed, a man must concentrate and specialize upon one thing; must keep his mind single to a specific career. He is, or has been a lawyer, an inventor, an engineer, a salesman, an advertising expert, and several other things; excelling in each capacity. And this very versatility has been an important factor in his success.



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Fig. 1. Loading a truck with 70 inch rolls of newsprint, each roll weighing approximately 1,200 pounds.



Fig. 2. Unloading newsprint rolls at the printing plant. The unloading cradle is tilted and the roll about to slide into the basement.

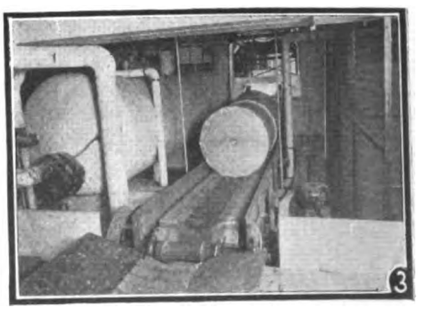


Fig. 3. The roll is picked up by the belt conveyor at the bottom of the delivery chute. (See Fig. 4, below)

Cutting Labor Costs

How a Modern Newspaper

By Osmore

ONE of the problems of the metropolitan daily newspaper has been the economical handling of newsprint in rolls, each roll weighing half a ton or more, between the freight car on track and the presses in the plant.

Unlike other industrial concerns, the newspaper has not been able to cut its raw material handling costs by locating conveniently on side track in the suburbs, and delivering directly from siding to plant. Considerations of reader contact, accessibility to advertisers, efficient delivery of circulation — all more important than cost of handling raw materials—have influenced newspapers in most instances to locate in or near the retail business center, which is usually distant from the terminals, and in which traffic is daily becoming more and more congested.

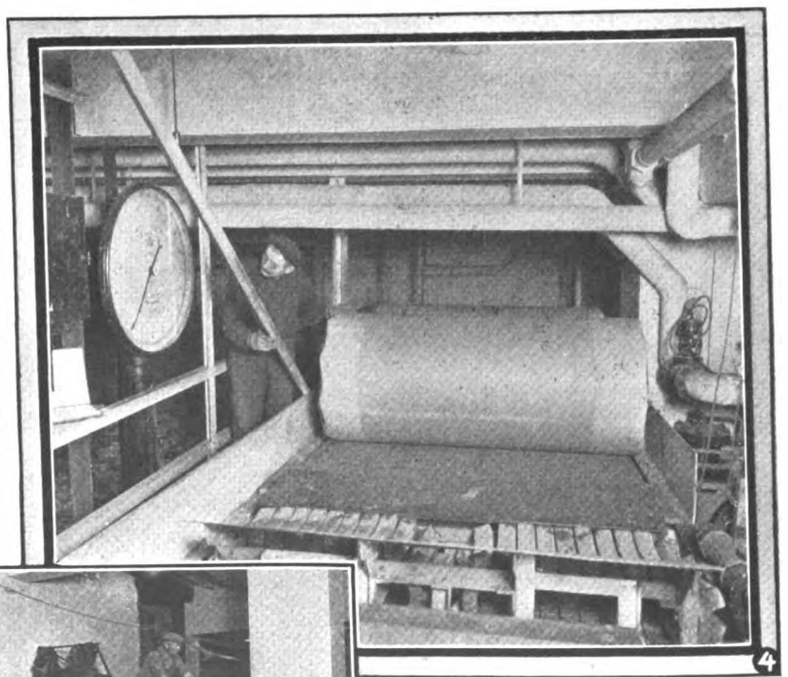


Fig. 4. Weighing. The roll has been spilled from the runway cradle to the runway, from the terminal of which it will be picked up by tiering machine.

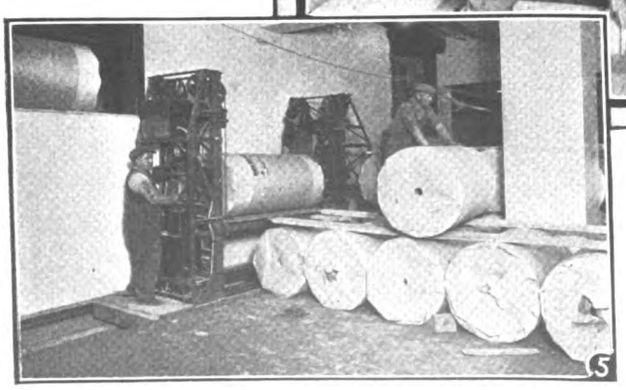


Fig. 5. Tiering machine delivers rolls to a storage bay, where they are stacked as shown.

The problem of paper handling was not great when the papers were small and of limited circulation. But now extending circulations and increased volumes of advertising, both local and national, have boosted newsprint consumption to the point where the metropolitan newspapers figure their daily requirements in tons rather than in pounds. Consumption of newsprint and traffic congestion have increased together.

In the location and construction of its new $2,000,000 home in Milwaukee, The *Milwaukee Journal* has probably come closer to the solution of this problem than most other American papers have yet done. In selecting a site, the *Journal* was influenced by the city's plan to erect a modern bridge over the Milwaukee River at State Street, since constructed, and by the proposed development of a wide artery along Cedar Street, connecting the lake shore with a civic center. The location chosen, at Fourth and State Streets, is three blocks north of the present retail center of the city, a block north of the proposed arterial, and on the new State Street artery, in a section still

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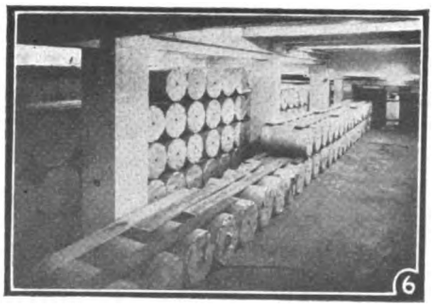


Fig. 6. Section of a storage bay, showing four-high storage, with planks to facilitate handling.

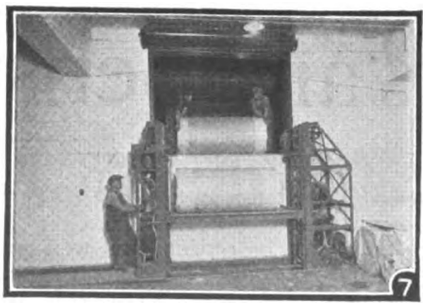


Fig. 7. Delivering newsprint rolls to the Reel Room loading platform.

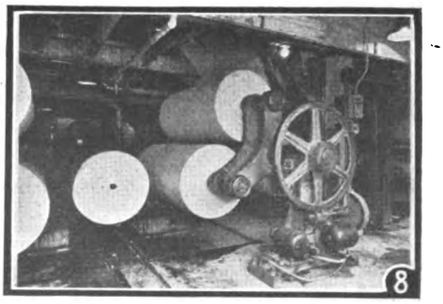


Fig. 8. Note the small car with movable track, which delivers the roll to the reel frame, beneath the presses.

in Handling News Print

Provides for This Essential Operation

R. Smith

largely undeveloped. More important from the standpoint of low handling costs, it is only four blocks from a rail terminal.

A site was leased at the terminal, and a loading platform was designed specifically to meet the paper's requirement that newsprint be handled with a minimum of labor. Its construction is exceedingly simple, merely a covered platform 60 feet long, and 8 feet wide. As the rolls are trucked from the car to the loading platform, they are tipped on their sides and guided down the platform and onto the waiting truck. Gravity does the heavy work; one man can do the rest.

The facilities provided to eliminate labor and strain in handling the rolls of newsprint in the plant are more ingenious, but almost equally simple.

Arrived at the plant, the truckman backs his truck to a fixed position. A hinged steel platform, electrically controlled from the receiving station, drops immediately behind him like a miniature drawbridge, its floor on a level with the floor of his truck, a simple but important device.

A cradle, concaved to fit the roll of paper, and so constructed that it will tilt inward on the pressure of a lever, is built into the platform. The truckman removes the tail pieces of the truck and gently rolls the paper to the platform. It drops into the cradle. With his foot he presses the tilting lever. The roll up-ends and disappears into the basement. At the bottom of a short slide, and before the roll has lost the momentum of its drop, it is

(*Continued on page* 42)

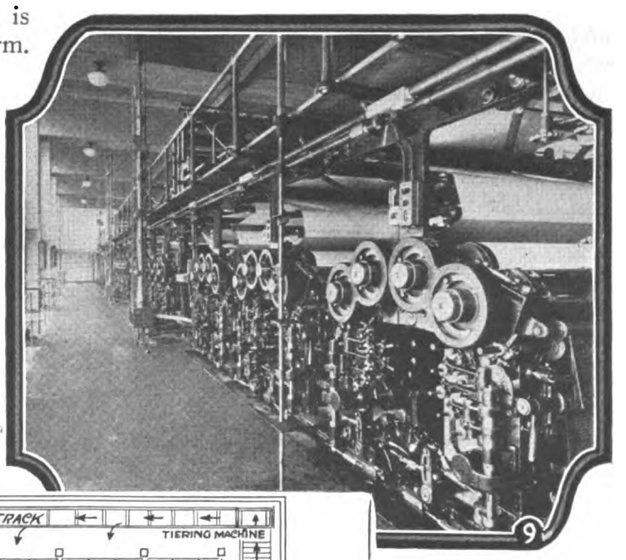


Fig. 9. Twelve straight line press units, located on the ground floor, with a capacity of 135,000 32-page papers per hour.

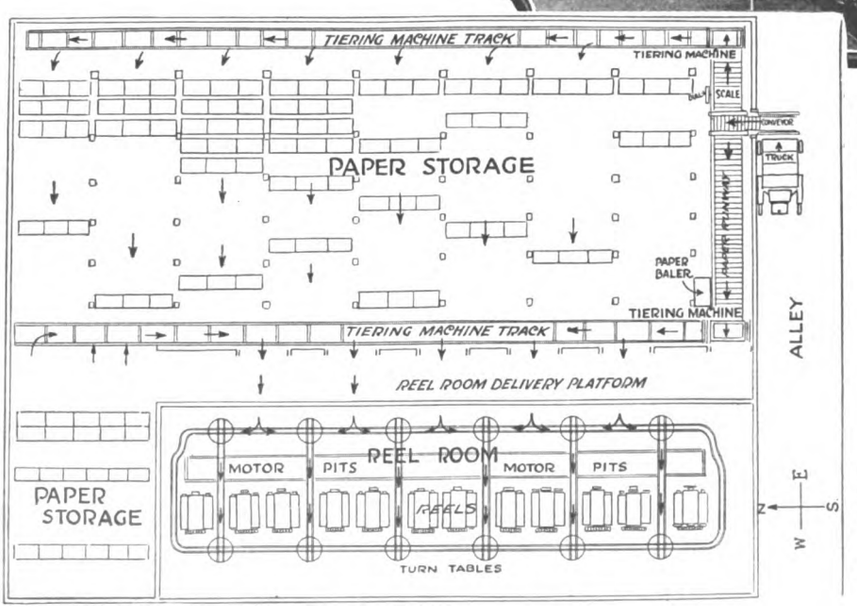


Fig. 10. Diagram showing the paper handling system, from delivery truck (upper right-hand corner) to the press reels at bottom of diagram.

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The Dollars and Sense of Safety

By H. Weaver Mowery

Graphical Visualization by Frederick H. Peard

CHARGED with a direct economic waste from accidents of over $1,000,000,000 in 1919—an amount equal to nearly one-third of the total exported manufactures in that year—can American industry afford to ignore a factor so important in its effect on domestic and foreign competition?

Authorities agree in estimating that 75% of this waste could have been prevented by proper safety measures.

Inasmuch as the one billion dollars did not include direct losses due to labor turnover, spoiled materials, defective products, lower productivity and morale of the workers, and other consequences of accidents and "near accidents," it seems conservative to add to the estimated preventable loss of $750,000,000, an estimated preventable indirect loss of $250,000,000, bringing the total preventable loss to $1,000,000,000.

Proof that investments in safety pay in economic as well as humane returns, lies with the individuals and organizations who have applied technical and executive ability to the problem and obtained results.

The Simmons Company, manufacturers of metal beds, had a particularly serious record with regard to finger accidents, due to a large part of their work being done on power presses. (See Figs. 5 and 6.)

A comparison of the 1921 record with the 1919 record shows an 87% reduction in lost time per man and 84% reduction in the number of accidents.

The Sperry Gyroscope Company reduced its compensation payments from $5.12 per employee in 1918, to $1.64 in 1919 and to 22 cents per employee in 1920.

The Raritan Copper Works show an 81% reduction in accident severity rate (days lost per 1,000 hours worked) comparing the year 1912 with 1920.

A reduction of 87% in accident severity rate was made by the T. H. Symington Company in 1920 as compared with 1919.

Henry Disston & Sons, Inc., show a reduction of 83% in the four years between 1916 and 1920.

These are typical of results obtained in large and small industries

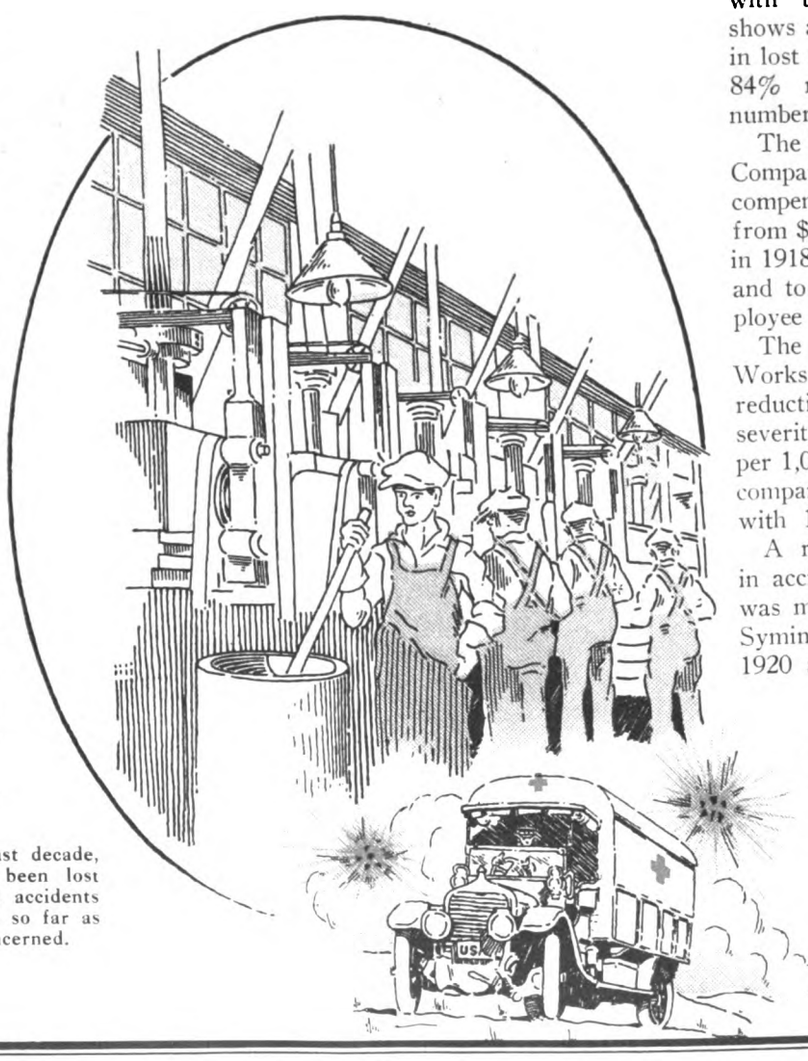


Fig. 1. For the last decade, more lives have been lost through industrial accidents than through war, so far as America is concerned.

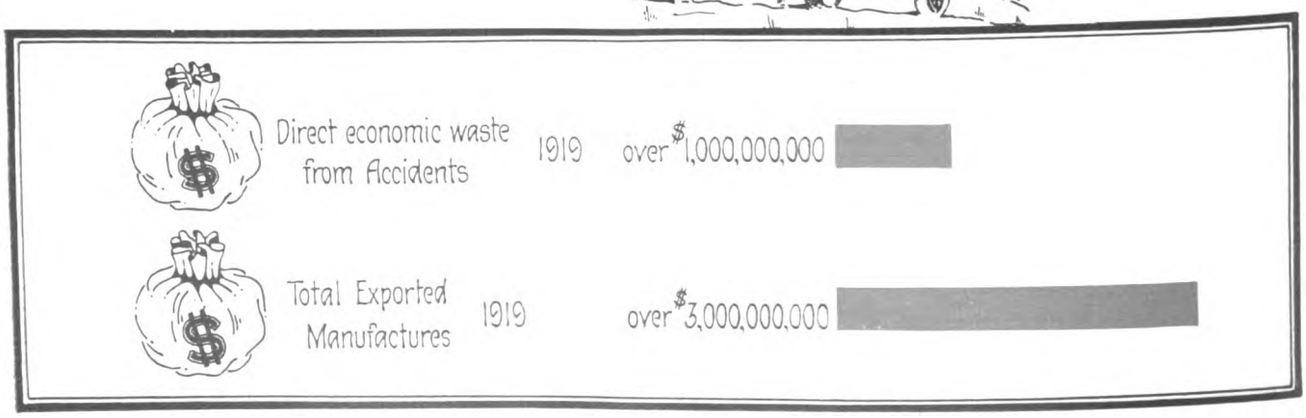


Fig. 2. In the last census year, the economic waste from accidents was equal to nearly one-third of the value of our total exported manufactured products.

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where safety measures have been consistently and scientifically applied.

Insurance company inspectors with a comprehensive knowledge of standard safety practice and its application, are anxious to assist in lowering risks — and lower risks mean lower insurance rates. The inspection engineering force of state labor departments will also give valuable aid. Membership in one of the safety organizations makes available the collected knowledge and experience of the members.

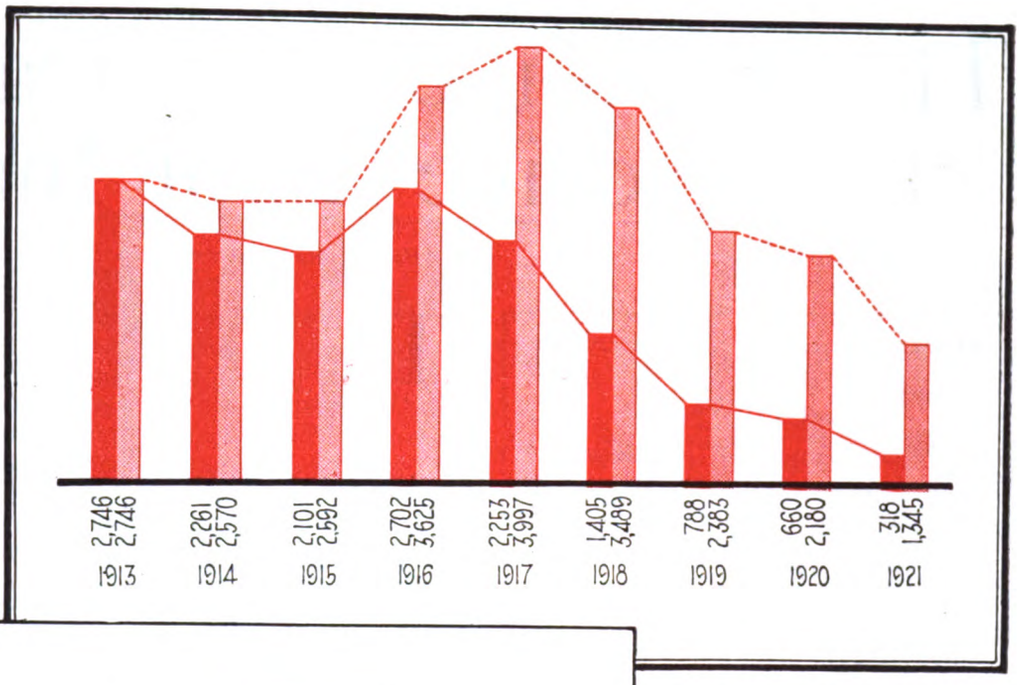


Fig. 3. Above—Based upon the accident figures of a large corporation for 1913, the dotted curve shows what would have been the record for succeeding years, while the solid curve shows how safety work brought the actual number of accidents downward.

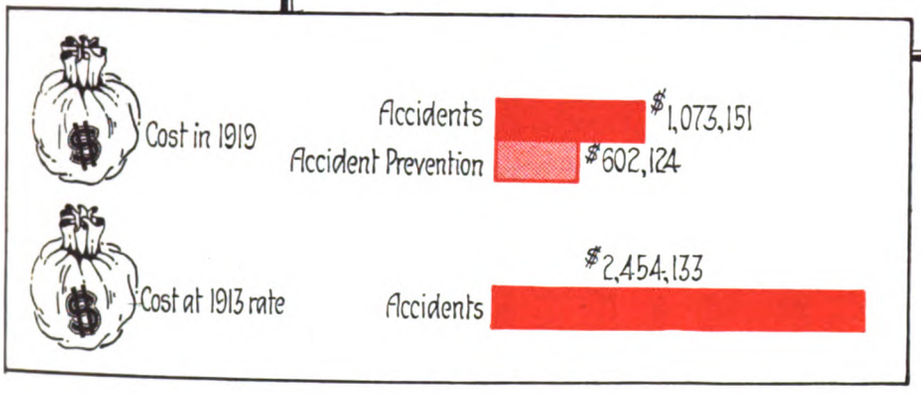


Fig. 4. If their 1913 accident rate had continued, liability fund expenditures of the American Smelting and Refining Company **would have cost, in 1919, more than twice the actual amount. And this saving was attained through an expenditure for accident reduction, of only $602,124.**

Codes are being formulated by safety engineering associations working in coöperation with state labor departments and other governmental bodies, to cover industrial and public conditions. These codes doubtless will be embodied into laws and safety measures be made obligatory.

If the 23,000 fatal industrial accidents of 1919 had been due to a single disaster, like the collapse of the roof of the Knickerbocker Theater in Washington, public opinion would demand the immediate formulation of codes and force their universal adoption. Spread out over the year, and occurring in different parts of the country, industrial accidents seldom reach the first page of the newspapers and their accumulated seriousness is not appreciated.

It is impossible to go into a detailed discussion of the application of safety measures to specific industrial conditions in a general article of this kind. The work naturally divides into the mechanical—making the buildings and equipment "fool proof," and the human element—educating the employee to appreciate the contributory effects of carelessness.

New buildings should be built and equipped to conform to the best practice with respect to lighting and ventilation, location and design of machinery, routing and character of the conveying apparatus—in general, to promote safe, efficient working conditions. Old ones should be remodeled and improved.

Steep, crooked stairways with slippery treads contribute their share to accidents. Guards are often in-

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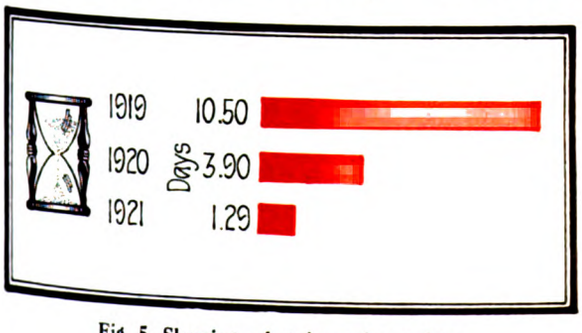


Fig. 5. Showing what intensive safety work in one plant did toward reducing lost time.

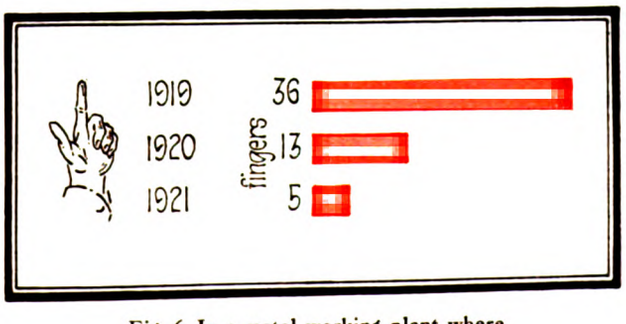


Fig. 6. In a metal working plant where much power press work is done, a safety campaign reduced finger accidents as shown.

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The Factor of Lubrication in the Machine Tool Industry

By Allen F. Brewer

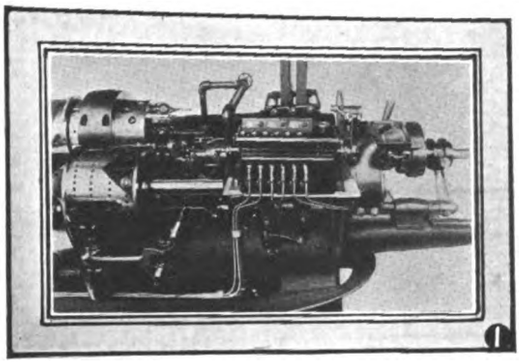


Fig. 1. A mechanical force feed lubricator installed on a chucking machine, showing the feasibility with which the oil piping can be laid out.

THE fact that "increase production" has become, perhaps, the most popular slogan of the modern industrial executive, has been responsible for more than one decided improvement in machine shop and tool room practice today. The war taught us a lot of things. To be true, extravagance was one of the most outstanding, but ways and means of increasing production also constituted one of our lessons. So, with the passing of the popular "cost plus" type of contract, extravagance, or as it would be more tactful to say, disregard of operating costs, naturally was given more attention, for in the average plant production requirements had gone up to stay, but unit costs had to come down.

Lubrication was early proved to be one of the salient factors in this attainment of maximum production. Too, it directly affected unit costs, so when these latter came into the limelight, lubrication, or the primary means which made them possible, demanded like consideration. The builders of machine tools have practically all come to realize this fact, and today centralized lubrication has been adopted to an almost universal extent. Wherever possible the gears, bearings, slides and guides of the modern lathe, planer, milling machine, etc., are lubricated in one fell swoop, as it were, by means of bath, splash or force feed lubrication. In fact, but for the several various exter-

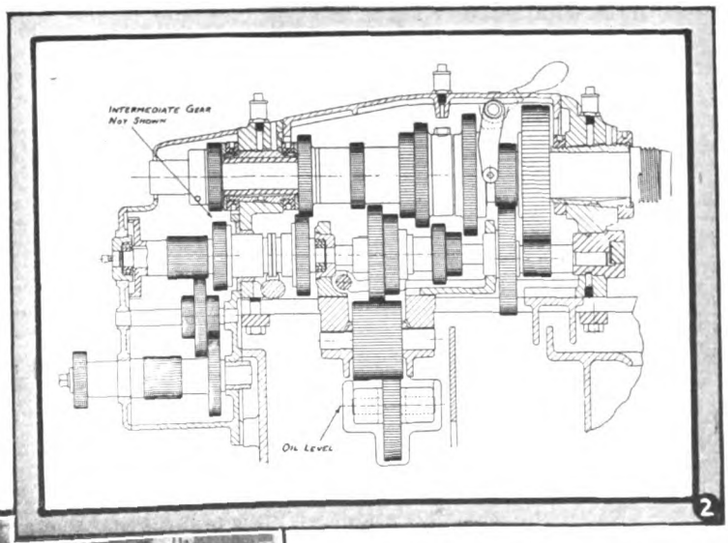


Fig. 2. Section through the geared head of an engine lathe showing the layout of the gears and their bearings, and the low oil lev l required.

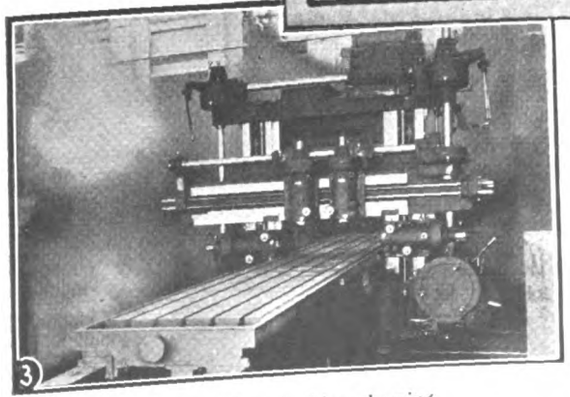


Fig. 3. A modern milling machine showing the several guides, slides, bearings and certain of the geared mechanisms which require careful lubrication. Centralized lubrication is a feature on many machines of this type.

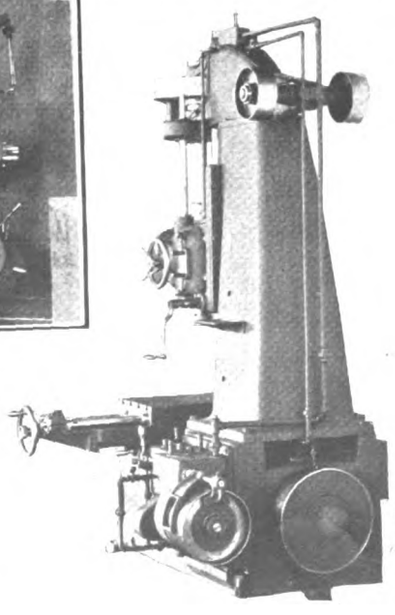


Fig. 5. Rear view of a jig boring machine. Note the oil pump at the left of the base of the machine and the vertical oil piping which transmits oil from the pump to the operating parts above.

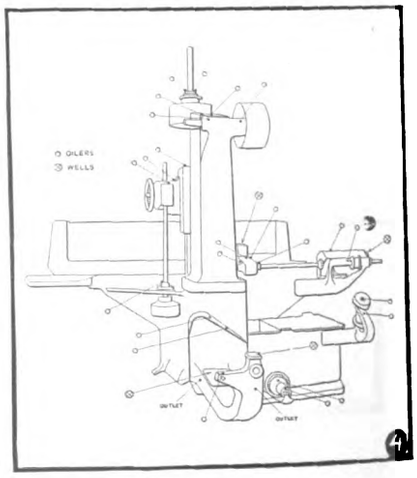


Fig. 4. Lubrication diagram for a grinder showing the many parts requiring lubrication and the type of lubricators installed.

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nal wearing parts which can still be very effectively lubricated on most machines by means of an oil can, sight feed oil cup, or grease cup, there is little else for the operator to bother about in this regard with the exception of noting the oil level in the one or more central reservoirs installed. So he is no longer generally required to delve into the innermost parts of his machine with an oil can or grease paddle or to stretch his hand into the hazardous proximity of a train of gears to adjust an oil or grease cup.

No wonder that production has increased as a consequence, and the noisy rattle of poorly lubricated gearing has practically disappeared on the properly designed machine. Furthermore, as the resultant wear has been materially reduced by more effective lubrication, so has it become possible to cut to far greater accuracy than ever dreamed of not so many years ago; for by this reduction of wear, clearances between wearing parts are maintained more constant

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Fig. 7. A high speed grinder with the shaft bearings lubricated by means of pin type grease cups. Cleanliness and economy are readily attained with such equipment, wherever it is applicable.

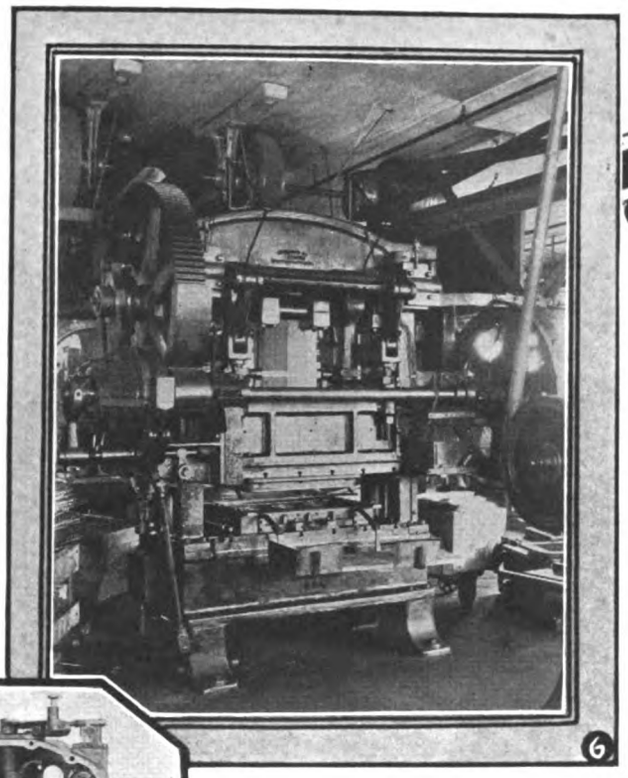


Fig. 6. An 8 feed rotary force feed lubricator for supplying oil to the bearings of a 3 compartment stamping mill. Note the relatively small amount of space taken up by the lubricator, and the belt drive.

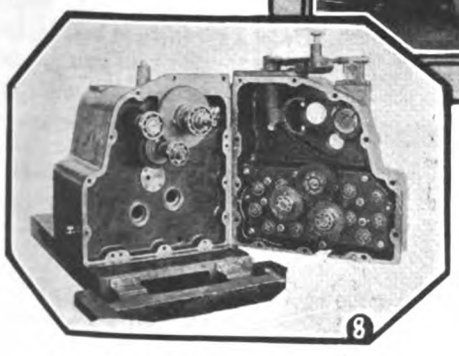


Fig. 8. An excellent illustration of the manner in which ball bearings can be applied to the operating mechanism of a modern machine tool.

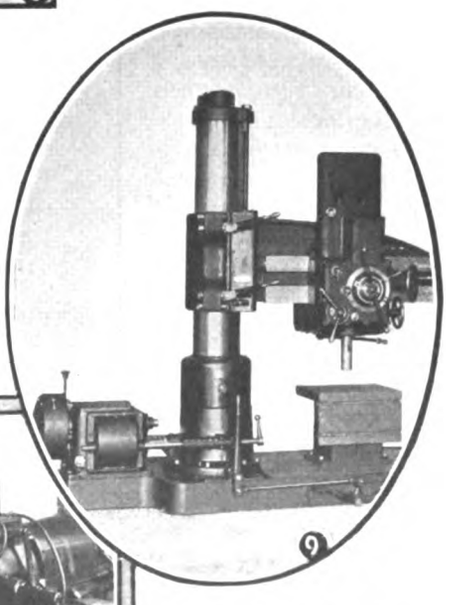


Fig. 9. Front view of a four foot radial drill with belted motor drive through a suitable speed box. This machine is provided with means for centralized lubrication. Note the several oil gage glasses or bulls-eyes.

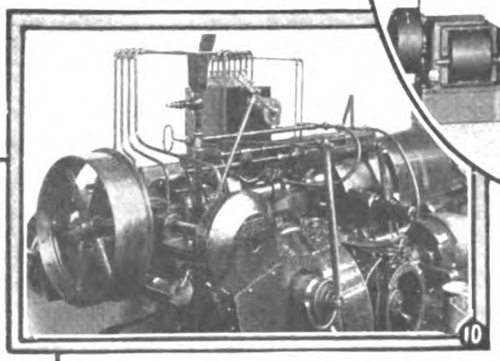


Fig. 10. The facility with which a mechanical force feed lubricator can be installed on the average machine tool, and the simplicity of the piping involved is vividly brought out in this illustration.

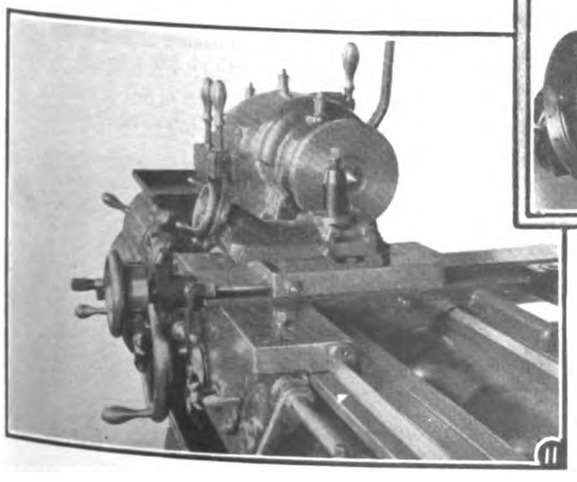


Fig. 11. Detail of the carriage of a modern lathe showing the wipers used for V lubrication.

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He Built the World's Largest Stove Business

By Dwight G. Baird

THINK of the word "Detroit" and note the associated thought that immediately springs up in the mind. "Automobile?" Certainly.

Detroit is known the world over as the center of the automobile industry and this reputation has so overshadowed the city's many other prominent industries that a very large proportion of those who are not personally acquainted with "the motor city" do not so much as know that it has any other industries. Detroit makes automobiles, the automobile plants of Detroit are the most efficient factories in the world. Detroit automobile manufacturers pay the highest scale of wages in effect anywhere on the face of the globe, the industrial leaders of Detroit are automobile men, the millionaires of Detroit made their millions in the motor car industry, those who have contributed most to the upbuilding of the city and to the civic welfare are automobile manufacturers, and so on.

All this is true, in a measure, of course, but the fact is often overlooked that Detroit was a city of 400,000 population before the automobile was invented and that it leads the world in the manufacture of many products other than automobiles.

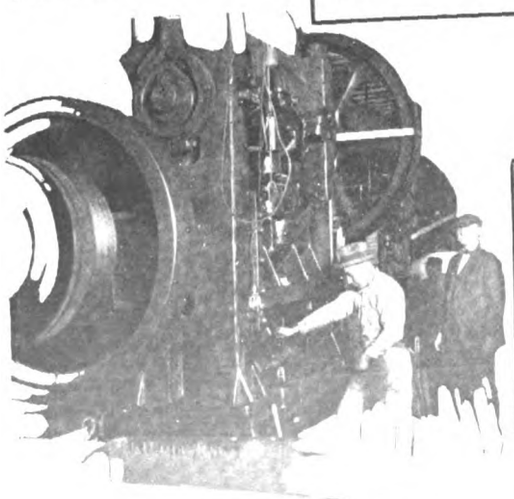


Statistics show that the automobile industry constitutes only about 60 per cent. of the city's industrial life. Other products in the manufacture of which Detroit leads the world are pharmaceuticals, adding machines, stoves, ranges and furnaces, paints and varnishes, marine motors, overalls, electrical devices of certain kinds, soda and salt products, twist drills, metal beds, perfumes, malleable iron, lubricators, gasoline torches, showcases, corsets, and tools of certain kinds.

Many other important industries, such as foundry and machine industries, slaughtering and meat packing, tobacco manufacturing, brass, bronze and copper manu-

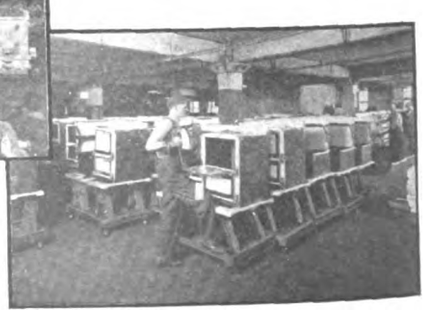
(*Continued on page* 34)

1. Above—George H. Barbour, one of the founders of the Michigan Stove Company, and chairman of its board of directors; which is quite a distance ahead of his first job at $50 a month.



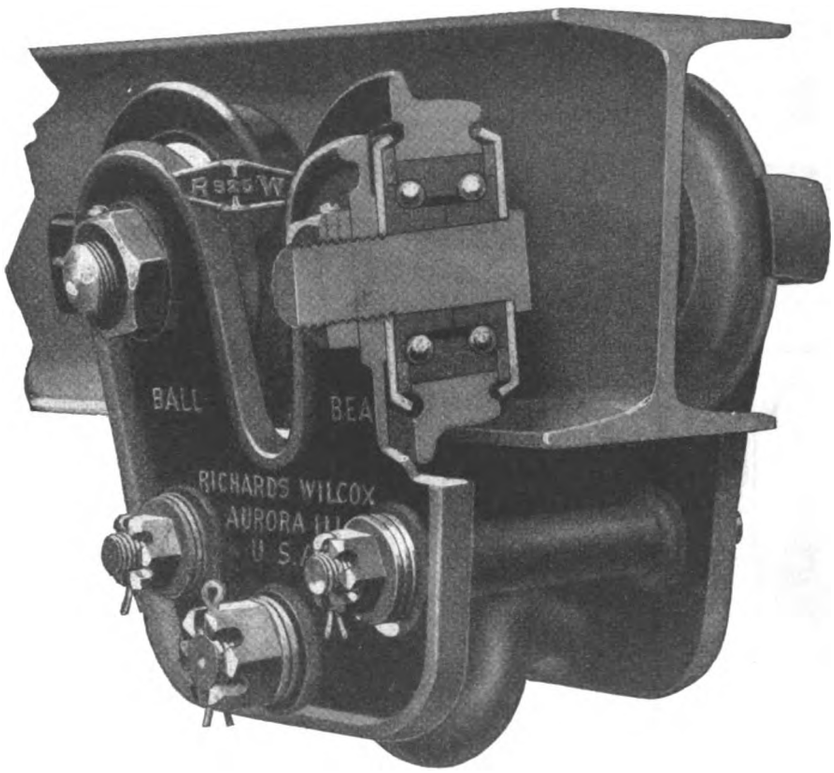
2. Located in Detroit, and shaping metal parts, this press is helping to turn out—not automobiles, but stoves.

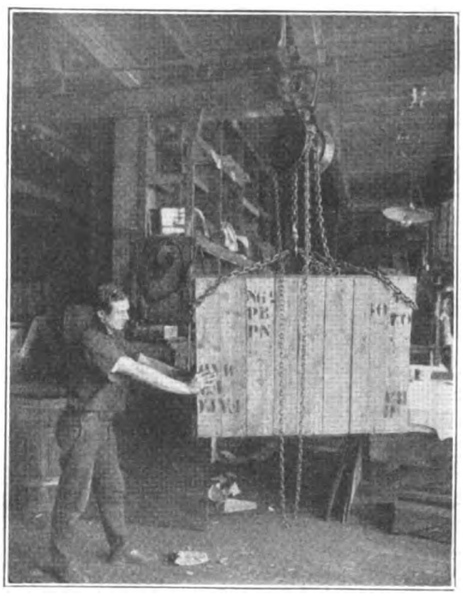




3. Scenes in a plant of the world's largest producer of stoves; centered in Detroit, which leads the world in other products besides automobiles.

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"Quality leaves its imprint"

Ralph W. Taylor, *President,* Jamestown Table Co., Jamestown, N. Y., *says*—

"Factory profits, in our opinion, come from stopping waste in every form. Turning wasted hours into dollars is one of the surest ways to make money, because labor is a constant cost in every business.

"For unloading our crates of supplies and materials, we formerly hired strong, heavy men, and powerful men draw higher pay than the average.

"Two years ago we put in a Richards-Wilcox OverR-Way System with No. 925 Ball Bearing Trolleys at our shipping door, with switches to the shipping department and stockroom. Now young men, 20% less expensive per hour, handle shipments in 50% of the time formerly required by the heavier men.

"Heavy cases of glass, for instance, weighing 2000 pounds, are easily unloaded, and shifted without breakage direct to open spaces on the storeroom floor. Other crates need not be shifted to make way for incoming or outgoing loads—we utilize the overhead space and raise or lower goods easily and quickly.

"The OveR-Way does away with the danger of strains and injuries that every manager fears, not only because the loss has to be paid by his company, but because he hates to see his men exposed to accidents that can be avoided.

"If we used the trolley continuously it would pay for itself ten times over annually, for in one hour a day its saving of 60% in handling cost pays for its first cost every year."

Here's a Statement You Can Prove Without Cost

We do not believe, *we know* that R-W No. 925 Ball-Bearing I-Beam Trolley will give you a service that cannot be duplicated anywhere, by anyone. *We know* that it will demonstrate its superiorities under actual working conditions. Knowing these things to be true, we gladly send this trolley for a FREE trial to any reputable manufacturer. If it fails to give you the satisfaction you think it should, send it back at our expense. This offer is far stronger than any claims we can make. R-W No. 925 is made in seven capacities—¼ to 4 tons. Ask for this FREE trial.

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

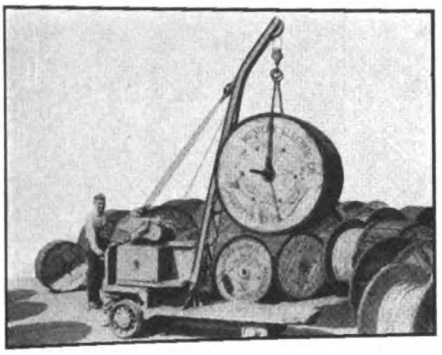
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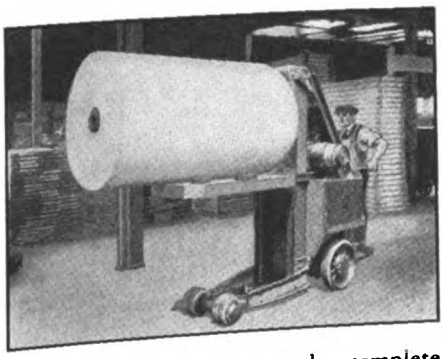
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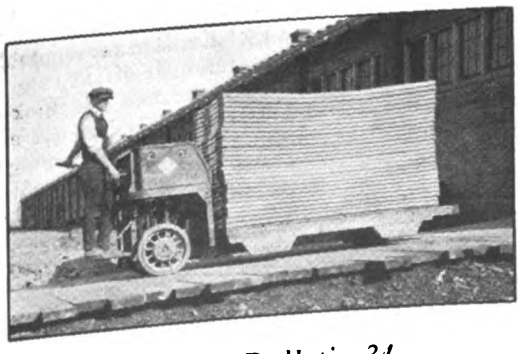
The Great Lift and Carry Triumvirate



The electric 3000 pound Portable Crane, 6000 pound Hi/Lo Elevator and 6000 pound lift Tructor.



These Elwell-Parker tools complete inter-department material transfer with safety and dispatch at surprisingly low cost.



Request Bulletin 34

The ELWELL-PARKER ELECTRIC COMPANY
Cleveland Ohio

He Built the World's Largest Stove Business

(*Continued from page 32*)

facturing, cereal products, shipbuilding, lumber industries, the manufacture of boots and shoes, chemicals, railroad cars, confectionery, fur goods, furniture, refrigerators, leather and leather goods, books and periodicals, pickles, preserves and sauces, and steam and hot-water heating equipment, contribute their share to the general prosperity of the city. In all, there are approximately 3,000 manufacturing plants in the city, employing over 300,000 workmen in normal times.

Take the stove industry, for example. On the spot where Pontiac, the famous Indian chieftain, made his last stand now stands the plant of the Michigan Stove Company, covering sixteen acres and having a floor area of over 540,000 square feet; the largest stove factory in the world. On down the avenue just a few blocks is the plant of the Detroit Stove Works, another huge plant, and there are six or eight other large stove and furnace factories in the city.

And as to contributing to the growth and civic welfare, few if any automobile manufacturers have been more active in this respect than has George H. Barbour, one of the founders and now chairman of the board of the Michigan Stove Company.

Mr. Barbour was the first president of the Michigan Manufacturers' Association—and he is not and never has been engaged in the manufacture of automobiles.

Mr. Barber was the first president of the Detroit Chamber of Commerce. In addition, he was for two years a director of the Chamber of Commerce of the United States and he was asked to become a director of the International Chamber of Commerce, but declined.

Mr. Barbour was president of the Detroit City Council for one term.

Mr. Barbour was appointed National Commissioner of the Columbian Exposition in 1893 (he still has his commission from President Harrison framed and hung on the wall of his office), and was president of the Michigan State Commission to the Pan-American Exposition in 1897.

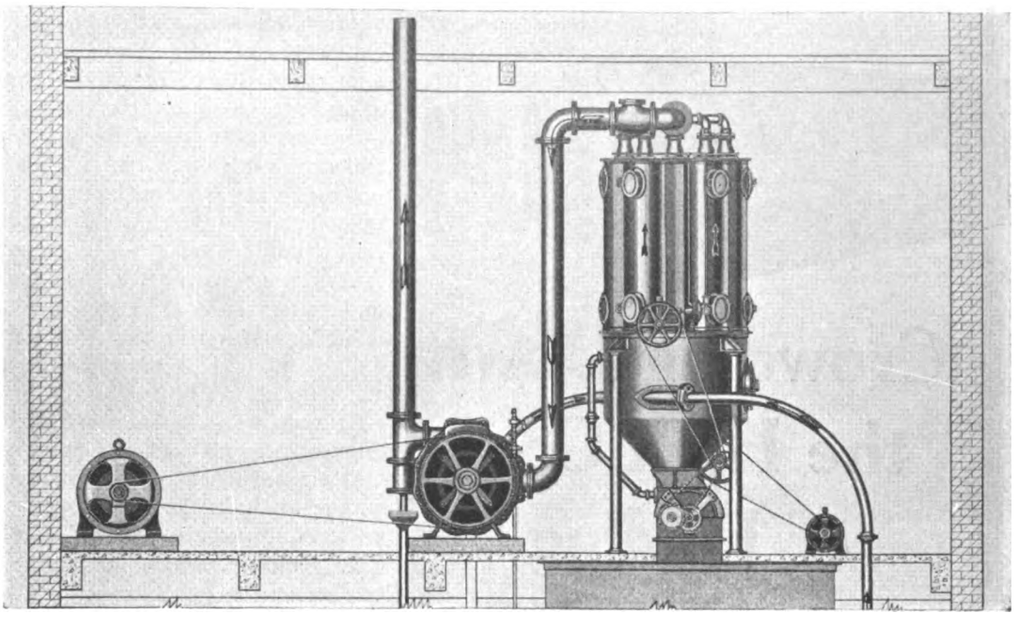
Mr. Barbour is vice-president of the Dime Savings Bank and a director of the People's State Bank. He is also president of the Ireland and Matthews Manufacturing Company, he built and organized the Michigan Copper and Brass Company and was its president till 1914, and he is a director of the Michigan Fire and Marine Insurance Company. He is a former president of the Detroit Institute of Arts, as well as of numerous clubs.

Down at Ormond Beach, Florida, Mr. Barbour is commonly referred to as "the Stove King" and the Hotel Ormond just recently dedicated the "Barbour Oval," which was named in his honor. Among those who took part in the ceremonies, and whom Mr. Barbour has a habit of "trimming" on the oval at frequent intervals, in spite of his eighty-odd years, were Mayor James Curley, of Boston; T. I. Crane, of Philadelphia; J. H. Behrens, of New York; W. L. Clark, of Philadelphia; Harry Frazer, of Richmond, and G. M. Snow, of Providence, Rhode Island.

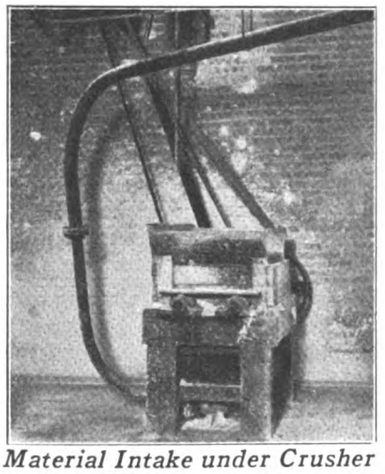
(*Continued on page 36*)

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DRACCO Pneumatic Conveying can be used for all dry materials —of special advantage on fine, dusty, valuable, poisonous, unpleasant materials.



Pump and Collecting Station



Material Intake under Crusher

Conveying Materials 371 Feet Through a Three Inch Pipe Line

One of the great advantages of DRACCO Pneumatic Conveying is the simplicity of construction and operation. Here two conveying lines are used for transporting lithophone. One conveying line runs a distance of 243 feet, the other 128 feet. Both lines run from two separate points, from crushers to the same collecting stations.

DRACCO PNEUMATIC CONVEYING SYSTEMS

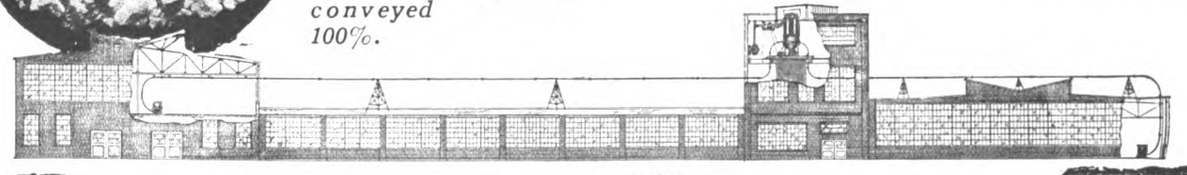
have many such installations, where many difficulties, hitherto unsurmountable, were successfully overcome. For in what other system would it have been possible to lay conveying lines through buildings, over the tops of other structures and through open spaces without the necessity of extra building construction? And consider also the fact that finely powdered or injurious materials can be conveyed without waste, with saving of labor, health and valuable space.

The experience of DRACCO Engineers on many Pneumatic Conveying Installations is available to you. They can soon tell you whether or not a DRACCO System is the solution of your problem.

We specialize on Pneumatic Conveying, Dust Collecting and Fume Recovery.



Materials like this ranging in size from 1 inch lumps down to fines are conveyed 100%.

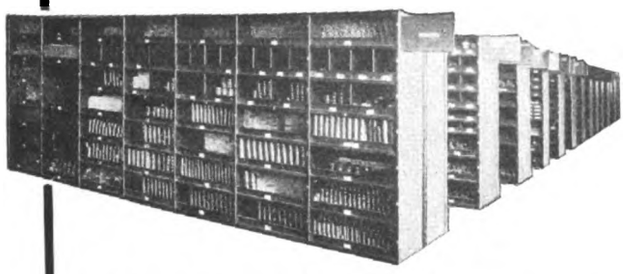


DRACCO DOES IT

THE DUST RECOVERING & CONVEYING CO.

Engineers and Manufacturers, Cleveland, Ohio.

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Crowding Down the High Cost of Finding

WHEN articles are stored in Durand Steel Racks, Bins or Shelving your costs of finding are cut to a minimum. Everything is arranged in a true "filed, cataloged form." Stock-room men are able to locate things with exceptional speed—there are no wasted trips to the wrong bin or the wrong shelf. In addition, they make easy the maintenance of a perpetual inventory. When stocks run low they can be easily checked and replenished.

The sturdy all-steel construction of Durand Steel storage units helps to crowd down finding costs to still lower levels. Upkeep, repair and replacement charges are held to a minimum. In addition, Durand Steel Racks, Bins and Shelving can be taken down and rearranged to meet changing plant or stock-room conditions.

DURAND STEEL LOCKER COMPANY
1539 Ft. Dearborn Bank Bldg., Chicago
1361 Pennsylvania Bldg., New York City
5-1537 General Motors Bldg., Detroit
2451 First Nat'l Bank Bldg., Pittsburgh
1024-220 South 16th Street, Philadelphia
239 W. 15th Street, Los Angeles

DURAND
LOCKERS BINS STEEL SHELVING RACKS

(*Continued from page* 34)

Was Smallest Stockholder

Mr. Barbour was brought up in Collinsville, Connecticut, where his father was proprietor of a general store and where George received his introduction to business at the age of nine. His father paid him $50 and his board that year for acting as janitor, porter, clerk, and general roustabout. He saved $12.50 of the $50, after paying all his expenses except his board, thereby making a good start on the career that in later years was to make him a millionaire.

At the age of nineteen, George bought out his father and took over a stock that inventoried between $5,000 and $6,000, for which he gave his note. Within less than four years, he had redeemed the notes in full, paying off the debt out of profits.

It was in 1872 that Mr. Barbour received a call to come west. He had a relative in the stove business in Detroit and when this relative learned of the formation of the Michigan Stove Company, he advised George H. to sell out, come to Detroit, and buy an interest in this new company, which he did, becoming secretary—and the smallest stockholder—in the new company that year.

The plant of the company was erected on its present site, but occupied only about four acres and undertook to produce only about twenty-five models; it now occupies sixteen acres and produces more than 450 different models of stoves, ranges and furnaces. The company was capitalized for $100,000. This later was increased to $150,000 and no additional capital has ever been required, in spite of the fact that annual sales now are about $5,000,000 a year. Mr. Barbour's salary was $100 a month, which was the same as that drawn by the president. The company employed one salesman and Mr. Barbour spent considerable time on the road himself.

Thereafter Mr. Barbour advanced steadily from one position to another till he reached his present place as chairman of the board of directors, holding at one time or another, every office in the company.

It was during Mr. Barbour's presidency that the company experienced its most rapid growth. Additional space was added, labor-saving machinery was introduced, the territory covered was gradually widened till it embraced the entire country, and the "line" was enlarged till it embraced just about every kind of stove or range made, in addition to several types of hot-air furnace.

As an executive, Mr. Barbour emphasized personal contact with the workmen and even now it is said that he knows practically all his employees by their first names. As a result of this intimate relationship, he built up an organization that came to be more of a "family" affair than an employer and employee attitude. If "John" or "Jim" were ill for a few weeks, his pay went on just the same, and if the same "John" or "Jim" were asked to do something other than his regular job or to work overtime, he never complained. It was all "in the family" and everyone was working for the success of the business. An employee had to be with the company at least ten years before he was considered "one of us" and to become a foreman one had to have many years of seniority indeed. At present, nearly all the foremen and superintendents have been with the company twenty or more years and, if the common labor be excepted, the labor turnover is practically nil.

(*Continued on page* 40)

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THERE'S a Grinnell Pipe Hanger for every purpose—every structural condition. They can now be bought by anyone. Our 120-page Pipe Hanger Catalog puts 40 years' practical experience into usable shape for you. Send for it today.



GRINNELL
Adjustable
PIPE HANGERS

The price-cut came down with a dull edge

THE old gentleman, pacing back and forth on the edge of the eighteenth green, did not notice his son's 10-foot putt for a birdie three. To a cheerful greeting he made no response. Halfway to the veranda he spoke: "Bob, I've got bad news—bad news. And no time to beat around the bush to make it easier for you."

Son: "You don't mean to stop work on the Erdonville plant?"

Father: "We're through with Erdonville. Lucky to get what it stands us on our books. The broker admits his offer comes from Yost & Yost. They played their high trump this morning with another 10% cut in prices. I got it straight over the 'phone from our Sales Manager in Chicago. I called the broker and he gives me till 5 o'clock to decide."

"I told you it would come," cut in the son, as he turned to the Consulting Engineer. "We've got to junk the old plant completely, double the capacity at Erdonville and get into full production there before the fall trade opens up."

"No," came the emphatic reply from his father, "I'm through. That last price cut will make a big deficit for next year. I'm going to sell now and save what I've got. I've been analyzing the figures all afternoon."

Son: "What figures! Your figures, the figures of the old plant—your—your—I'm sorry, Dad, but I can't make it easy for you either. The old plant is a monument to low bidders. Everything in it was bought on price and not on performance. And nobody knows it better than Yost & Yost. They're afraid of me, not you; of my methods and the new plant, not of your methods and your old factory."

Father: "The product of the old plant has won every gold medal since the Chicago World's Fair."

"Everybody admits that," said the Consulting Engineer. "But where are the fine workmen who helped win those medals? You've run an apprentice system for the whole industry. Why?"

Father: "They drift to the cities. You can't stop it."

Son: "No, 80% of our terrible labor turnover is due to physical discomfort and nothing else. I've traced it down to that old steam heating system. It's one of the weasels hiding in our overhead, sucking out the profits."

Consulting Engineer: "Your son months ago foresaw the strategy of your competition. He set out to make their price cut come down with a dull edge. They know they can't compete with Erdonville, its lower power costs—up-to-date machinery, satisfied labor, made more efficient by ideal plant temperature. On top of that the hot water heating system will save $5,000 in fuel cost.

Father: "If you're selling heat the same as light and power are sold, the way McLaughlin sells heat, I'll admit hot water is the only thing, but otherwise the investment is too great."

Son: "That theory was exploded long ago. McLaughlin made his success as a production manager before he ever thought of selling heat as a commodity. The secret in his own words is this: 'Buy plant equipment as if you had to make your living selling its performance against the performance of anything else on the market.'"

Father: "Has McLaughlin seen our plans?"

Consulting Engineer: "Yes, and he's sure the savings will be better than $5,000. He urges us to accept that offer to build 50 small houses north of the Erdonville plant. Selling heat from our own system at 15 cents a day per house he says will give us a shade better profit than he makes.

Father: "That really sounds practical. Boy, you have got a head on your shoulders; you are thorough; your plan insures money-making performance. Most of us depend too much on low bids and low first cost."

Son: "Where's the 'phone. No, not the broker; the Grinnell Company. I'm going to order all that piping work now. No more weasels for us. This time we're going to have a plant—a Gold Medal plant."

* * * * * *

FOR further information write today to Grinnell Company, Inc., 307 W. Exchange Street, Providence, R. I.

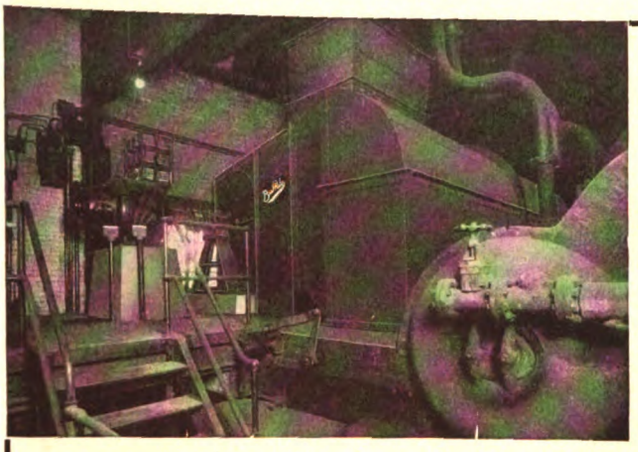
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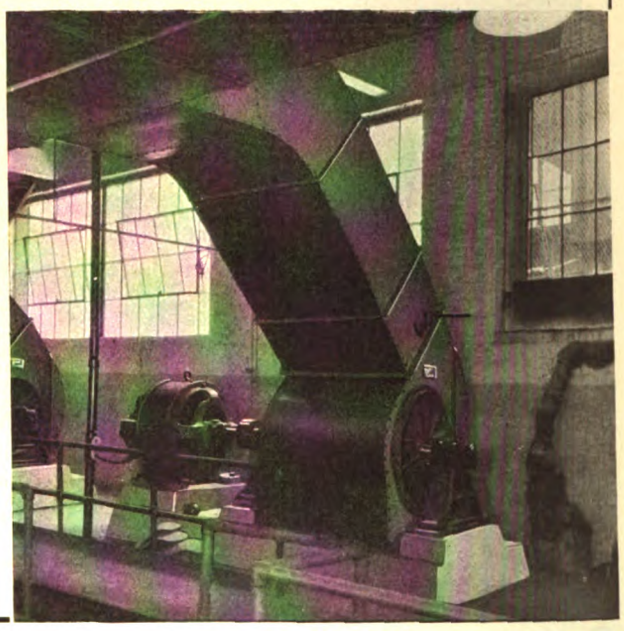
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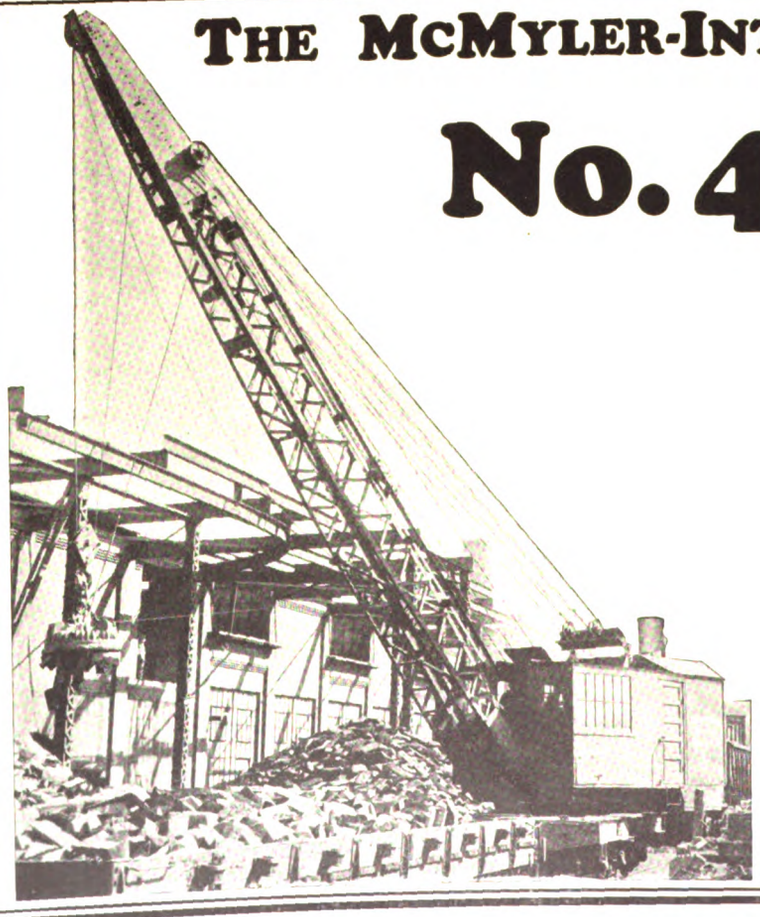
TO bridge the wide gap between the requirements of the huge central station developing horsepower to handle the needs of a city; and the individual manufacturer who is interested only in economical production of power for his own use, we must know ALL the facts about building and applying mechanical draft apparatus.

That we DO know them is indicated by the increasing number of both types specifying "Buffalo."

Buffalo Forge Company

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THE McMYLER-INTERSTATE CO.



No. 4

—For handling pig iron or scrap with an electric magnet.
—For handling coal, coke, or ashes with a clamshell bucket.
—For handling pulp wood with a grapple.
—For loading and unloading freight cars.
—For switching cars.
—And for any sort of industrial service requiring a powerful, flexible and easy handling 20-ton crane.

McMyler-Interstate locomotive cranes are built in sizes of from 10-tons to 50-ton

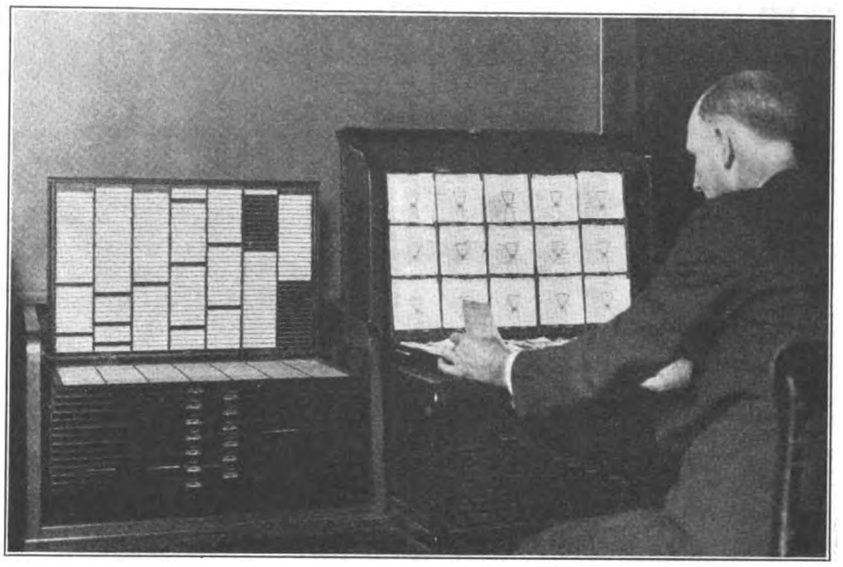
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Not until McCaskey came in could they find what they wanted when they wanted it. Now valuable information is at their finger-tips.



The Armstrong Cork Company Doesn't Guess—They *Know*

The Beaver Falls Plant of the Armstrong Cork Company makes some 12 different classes of cork products—insulation, tile, brick, etc. As each class covers many different items, efficient production control requires records that make the quantities of stock on hand quickly available.

A McCaskey Cabinet with a capacity of 660 items was installed in 1916 to handle the finished stock record. About 5 years later another cabinet increased the capacity to 1100 items.

In reporting movements of stock, a yellow ticket indicates the last finishing operation and the transfer of stock into warehouse. A red ticket indicates a transfer of defective stock which may have to be reworked. A white ticket indicates shipment out of warehouse. The carbon backed McCaskey forms produce 2 copies at one writing, giving a valuable check.

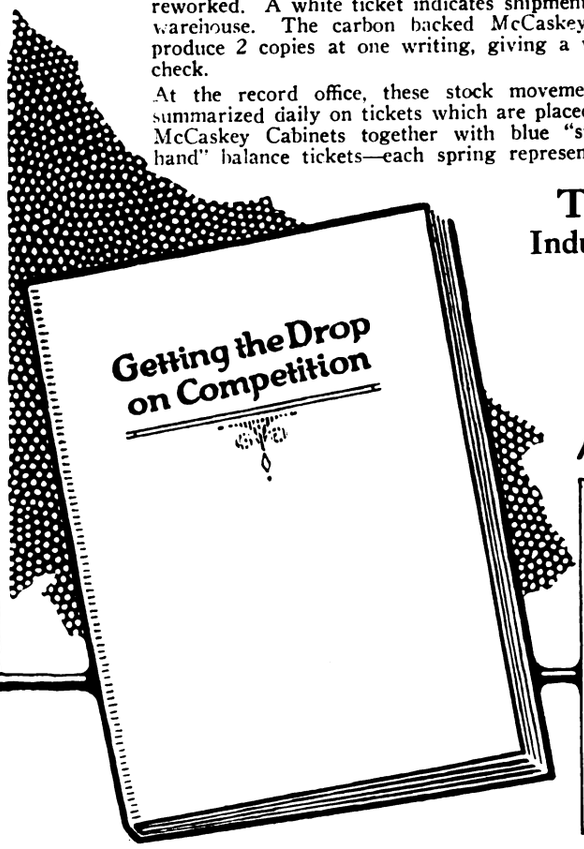
At the record office, these stock movements are summarized daily on tickets which are placed in the McCaskey Cabinets together with blue "stock on hand" balance tickets—each spring representing an item or group of sizes. Each month a stock record balance sheet by items or groups is prepared from the blue "stock on hand" tickets.

This system was in effect in principle before the installation of the McCaskey equipment, but the records were kept in books and the information was not readily accessible. The McCaskey Cabinets give the exact stock situation on any item in a few seconds. The monthly balance sheets are now ready 3 days earlier than before.

The McCaskeys save about one-third the former labor cost, which more than pays for the installation yearly.

What the McCaskey does for this company, it is doing for many, many others. The flexibility of the McCaskey Industrial Control Method—and it is flexible because it is merely a basic idea—permits the application of the idea to any form of business.

Write today for our booklet "Getting the Drop on Competition." It contains some valuable information. And it's free.



THE McCASKEY REGISTER CO.
Industrial Division Alliance, Ohio

McCASKEY ONE WRITING SYSTEMS

MAIL THIS COUPON TO-DAY

The McCASKEY REGISTER CO.
ALLIANCE OHIO.

Your booklet "Getting the Drop on Competition" might help me. Please send me a copy free of any obligation.

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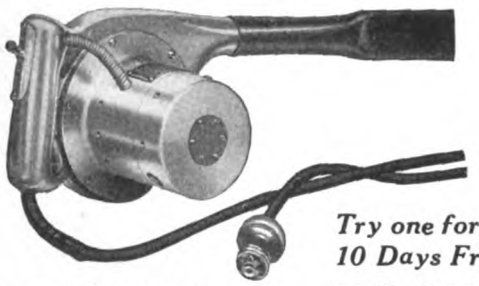
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This compact and efficient portable tool will become an indespensable aid in keeping your motors, generators, switchboards and machines free from dust and dirt.

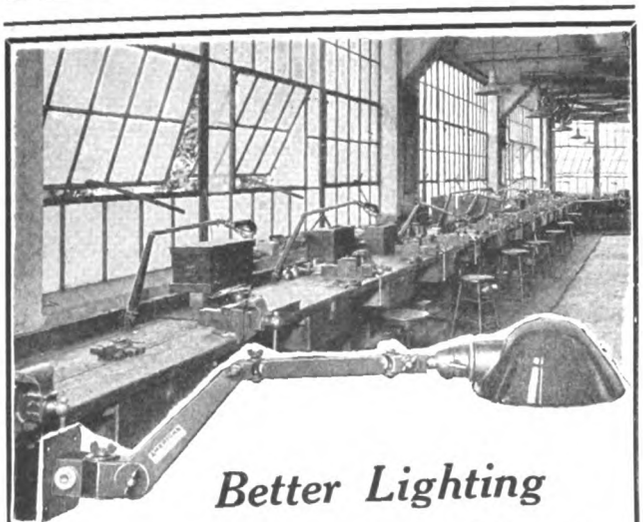
This Portable Blower is also suitable for use on blow pipes, soldering outfits, and small gas and oil furnaces.

Built compactly — light weight — only 6½ lbs. — handy to use — popularly priced—only $40.00. It has an air cooled universal AC or DC 110 volt or 220 volt ball bearing motor perfectly balanced. 20 feet excellent cable and armored plug. Toggle switch in handle, operated by thumb. Metal conduit carrying wires motor to handle. Absolutely guaranteed to give entire satisfaction. Let us send you a Marvel Portable Blower on 10 days' free trial.



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"MARVEL" PORTABLE BLOWER



Better Lighting Produces Better Work

An American Fixture placed at a bench or over a machine intensifies the light to exactly the place it is needed most, without throwing the glare into the face of the employee.

American Fixtures are designed by lighting engineers who have demonstrated that the right fixture in the right place not only safeguards the health of the employee, but enables him to produce better work and increases his efficiency from 25% to 50% in production volume.

Made in six styles. Catalog and prices on request.

American Fixture Company
230 West Water Street
MILWAUKEE WISCONSIN



(*Continued from page* **36**)

An example of Mr. Barbour's method of developing his own men is afforded by an incident that occurred in the early days of the telephone. He called up a concern in the city one day and was so impressed by the pleasant, courteous voice and attitude of the telephone operator who answered that he made inquiries as to the latter's identity. On being told that the speaker was the telephone operator there, was a boy of fifteen, and was getting $5 a week, he asked the lad to come in and see him. The lad did so and Mr. Barbour employed him as office boy, at $7 a week.

The lad justified Mr. Barbour's opinion of him by discharging his duties efficiently, taking an interest in everything about him, then advancing to the factory, to the office, and on the road as a salesman. He is now general manager of the company. His name is L. B. Young.

Mr. Barbour is still active in the business he did so much to make the greatest of its kind in the world, and is eagerly planning to make it still greater. In spite of the general impression that prevailed throughout the country last year, 1924 was the biggest year in the history of his company, he says, and he expects 1925 to be still bigger.

THE value of exports last month, according to the preliminary report, was $452,000,000, the largest monthly total since November, and 33 per cent. above the figure for March last year. It has been exceeded only twice in more than four years. The value of imports was $385,000,000, the largest total, with the single exception of that reported two years earlier, since August, 1920.

These totals bring the aggregate value of exports in the first quarter of 1925 up to $1,269,000,000, which is 15 per cent. larger than that a year ago; while the value of imports is more than 12 per cent. above the corresponding figure last year. The excess of exports for the three months was $204,000,000, which compares with an export balance of $153,000,000 a year ago and an import balance of $47,000,000 in the first quarter of 1923.

Power Show and Mechanical Exhibit at Milwaukee

THE annual Midwest Power Show and Mechanical Exhibit will be held at the Milwaukee Auditorium, Milwaukee, Wis., May 18 to 21, 1925.

This exhibit has become an annual institution and is similar to the National Exposition of Power and Mechanical Engineering which was held in New York. At both of these annual exhibits there is a broad representation of high-grade labor-saving products.

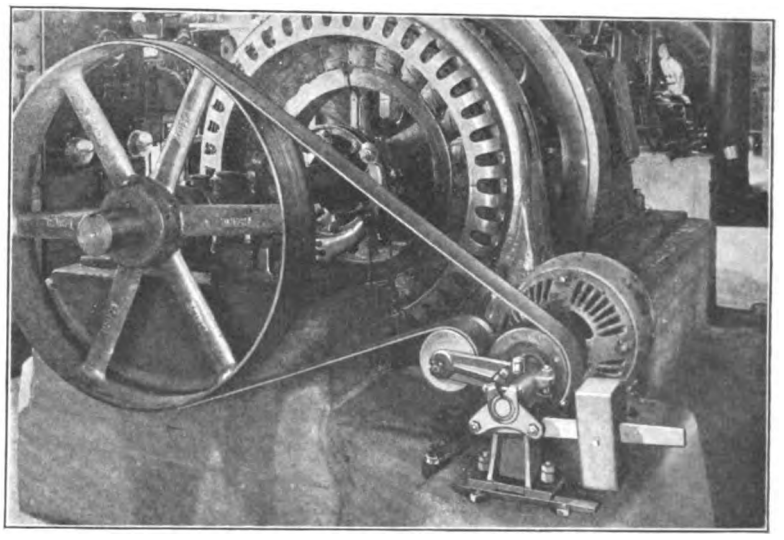
Executives who are following our editorial campaign for the reduction of power costs will find it of interest and profit to attend the Milwaukee exhibit.

Ralph H. Cahill is secretary with address at City Hall, Milwaukee.

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A Convincing Testimonial

OIL ENGINE DRIVEN 6 K.W. EXCITER
Driving Pulley 40" dia., 6½" face, 300 R.P.M.; exciter pulley 8" dia., 7" face, 1500 R.P.M.; pulley centers 4'0".



Five Points:

1—The LENIX increases the arc of contact between belt and pulley.

2—The LENIX maintains constantly and accurately the proper tension in the slack side of the belt.

3—The LENIX saves floor space, building space and belting because of freedom in pulley locations.

4—The LENIX saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The LENIX permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

The increasing popularity of the synchronous motor in practically every industry has made the efficiency of the exciter drive a question of prime importance. From the point of view of efficiency and low first cost, the belted exciter is the most desirable. With the LENIX it becomes ideal.

Belt slippage is positively eliminated even on extremely short pulley centers and the automatic action of the LENIX causes it to maintain just sufficient tension in the slack side of the belt to transmit the load.

A steadily increasing number of LENIXES is being sold for exciter drives. Read what one user says about his installation.

> "Replying to yours of the 25th ult. as to the satisfaction we are receiving from the LENIX drives on our 12½ and our 6 kilowatt exciters, would say that they have been in daily use for over five months and we are satisfied with the service they are giving beyond our fondest hopes. In fact, I much prefer the LENIX drive over a direct belt drive on account of the great reduction in belt tension and the reduction of heating in the exciter bearings."

The LENIX is not an idler. It is a "belt wrapper" scientifically applied to belt drives for the purpose of saving floor space, eliminating belt slippage and increasing the general capacity of the drive.

Send for booklet Saving Slippage and Space

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Yet it costs about the same as hard-to-read glass-tube thermometers of the better grade.

Furnished with tubing or rigid stem for temperatures between minus 40° and plus 750° F.

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Made by the manufacturers of the famous Boyce Moto Meter



MOTOCO
INDUSTRIAL THERMOMETER

Cutting Labor Costs in Handling News Print

(*Continued from page 27*)

picked up by a wooden belt conveyor of special design and delivered to another cradle placed in the center of a runway extending across the width of the paper storage room, and sloping from the center to the two ends. A receiving clerk, stationed just behind the cradle on a narrow runway parallel to the paper runway, checks the receipt of the roll on his copy of the invoice, and tilts the cradle to the left. The roll spills onto the runway and moves slowly along, passing over a platform scale where the receiving clerk may get the weight, until it is stopped by a bar across the end of the runway. Here it meets a tiering machine, running on a stationary track the full length of the east wall. The machine operator elevates his platform to the height of the runway floor, trips the end bar, and the paper roll slides onto the tiering machine, whence it is delivered to one of the storage bays.

Rolls are stored flat, four tiers high, with planks under each tier, which permits of easy handling in delivery to the reel room.

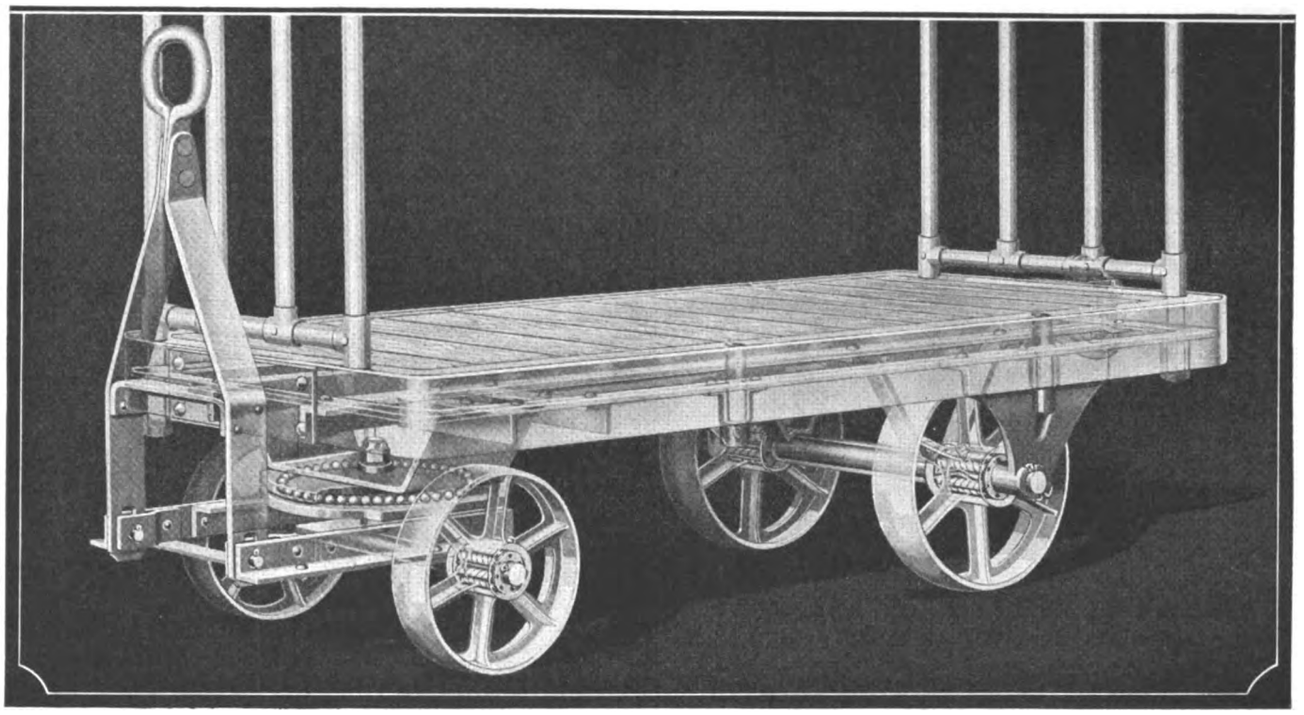
The tilting device in the cradle of the runway will spill the roll to the right, if desired, as well as to the left, in which case it is picked up by a tiering machine running parallel to its twin but along the opposite wall. This machine delivers all rolls from the storage bays to the reel room floor through openings in the wall between storage room and reel room. The concrete platform to which deliveries are made is about a foot higher than the floor of the reel room proper. A "dolly," or small hand car with a concave surface, is trundled on its miniature track up to the delivery platform, and the roll is pushed on to the "dolly." The loaded "dolly" is run over the track and, by means of a system of turntables, switched to its delivery point on the reel line, where the roll is hooked up to a reel ready for printing.

That part of the basement floor used for paper storage is raised about a foot above the level of the basement proper, primarily to safeguard the paper against dampness. In addition, a covered trench of concrete, serviced by a pump, the motor of which will start running the moment water completes an electrical contact, extends entirely around the storage floor on the lower level and next to the basement wall.

The saving in the cost of labor is about one-half over the method employed by the *Journal* in its old plant, considering labor employed by the company under contract to handle storage. Formerly, three men were required to unload the paper from the car and load it onto the truck. Now, thanks to a loading platform built for the purpose, two men do the work of three, and do it with less effort. One 5-ton truck is required for hauling where two were operated. Six men handle all paper into storage; deliver it to the reels after having removed the wrappers; strip the cores of their residue of paper when the rolls have been run; bale the waste; tie up the cores for return to the mill in carload lots; and load the cars. Four men were previously required to handle paper in the plant alone, with frequent assistance of pressmen in making deliveries to the press room. In addition, the storage company which received and stored the paper under contract, employed fully as many more.

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Heavy Duty—Carrying Capacity 4 Tons



Mercury Type "A-510"

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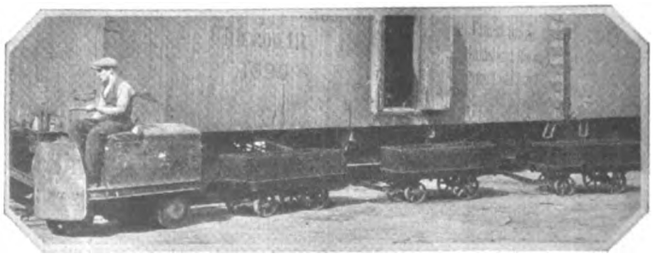
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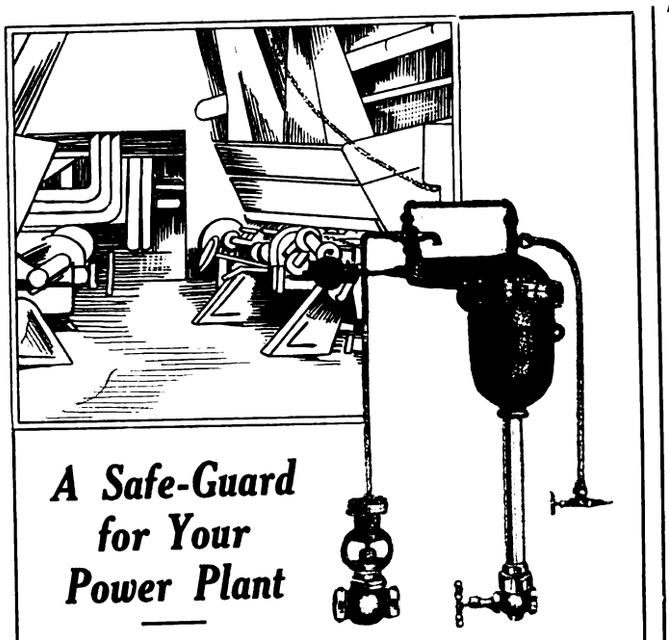
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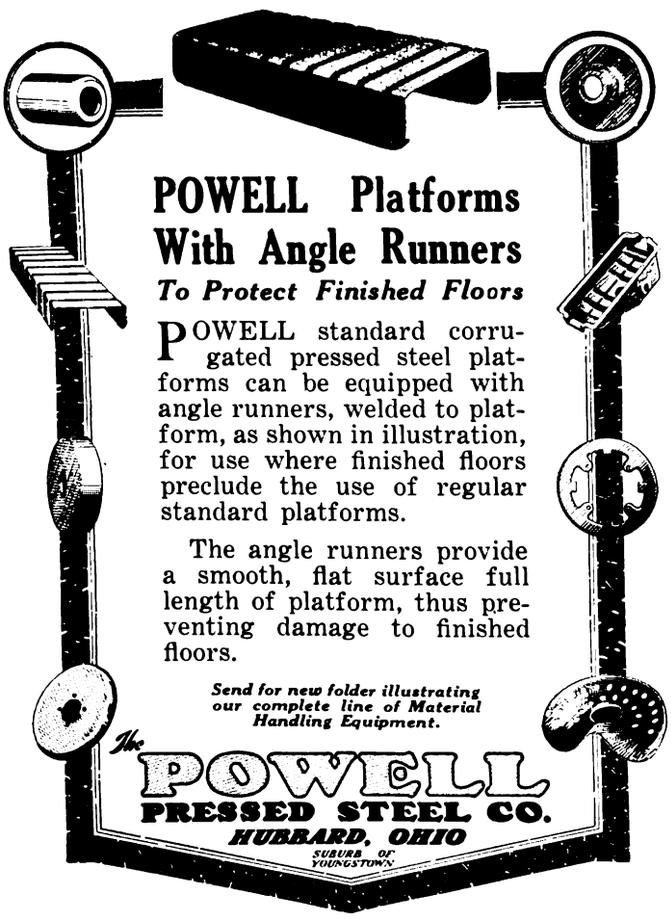
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Figured in dollars and cents, your boiler room is a costly investment. You cannot afford to take any chances. A Vigilant Feed Water Regulator gives positive control of boiler feed water. It eliminates entirely the dependence on the human element. It is entirely operated by gravity—no floats, tubes or diaphragms to get out of order.

Put a Vigilant to work on your boiler. It is the best insurance you can carry and the cost is small.

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The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
SUBURB OF YOUNGSTOWN

The Factor of Lubrication in the Machine Tool Industry

(*Continued from page* 31)

and the necessity for machine adjustments, which so often may affect the accuracy of cutting, is practically eliminated where the lubricating system is functioning effectively with the proper grade of oil.

In this study it has been deemed advisable to start with the cutting tool, working from there back through the bearings, gears and sliding surfaces of the machines themselves. To the layman, cutting tool lubrication involves, perhaps, the most prominent usage of lubricants, in the machine shop; in turn, in the eyes of the tool room operator it is probably regarded as the most important usage. Somehow or other gears, bearings and slides have an ability to function even though their lubrication is neglected; but cutting tools in general balk under such neglect. Especially is this true where cooling as well as lubrication must be effected.

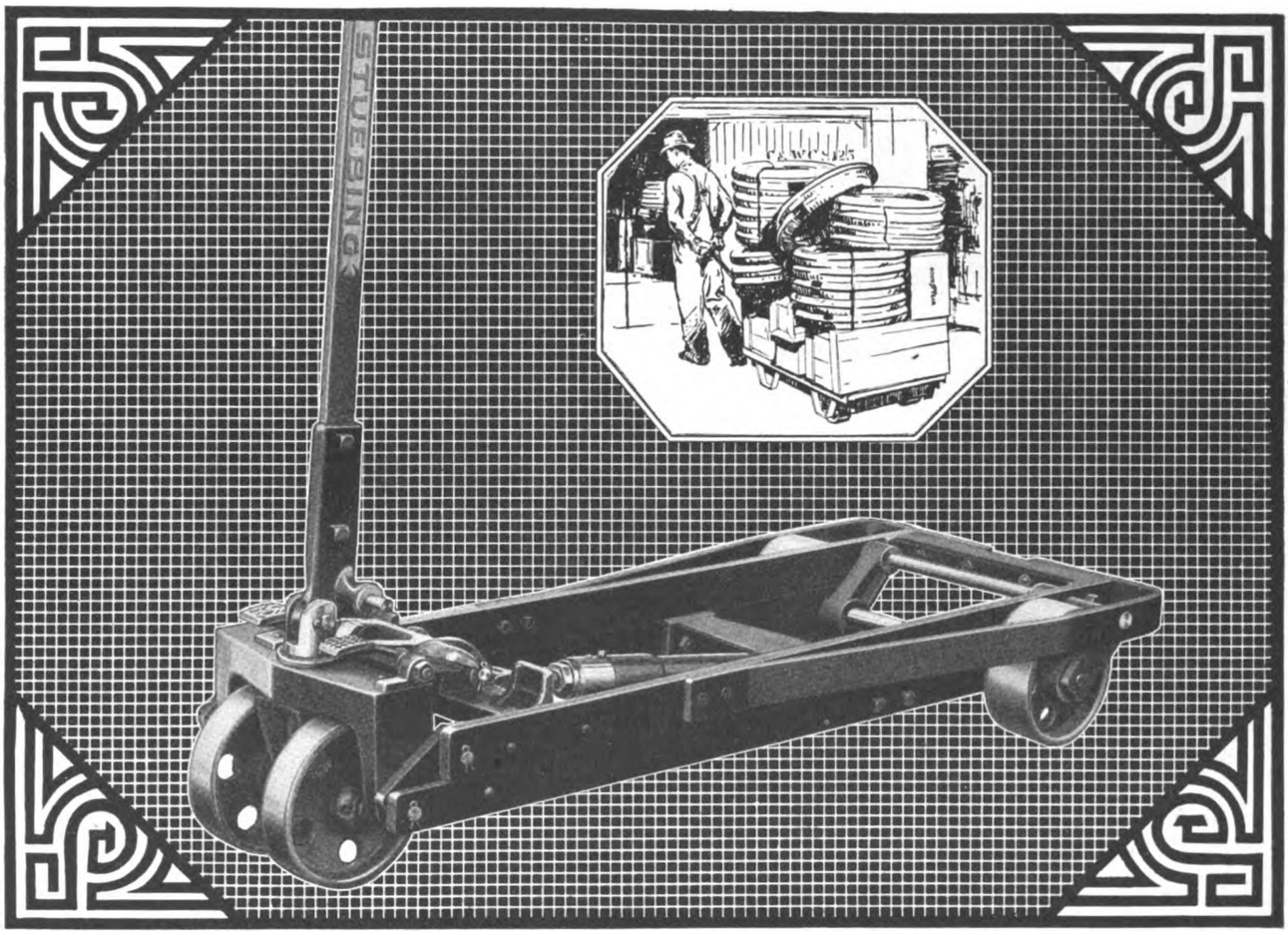
The executive, however, must concern himself with general machine lubrication, for proper lubrication means economical power consumption and reductions in upkeep and maintenance costs, and he is the one responsible for the power bills and the operating expenses. The best insurance that these will be maintained at a minimum, and that his unit production costs will average below those of his competitors is, of course, effective lubrication, or in other words the greatest reduction of solid friction possible.

Essentially, machine tool lubrication can be regarded as involving three distinct classifications, i. e. gearings, bearings and slides or guides. Gears, as the power transmitting mechanisms, may well be considered as perhaps the most important as a general rule, even though such other parts as the lathe spindle, or the V's of a planer, etc. are regarded as the most important constructional elements. The gears make possible the attainments of the necessary speed reductions in the average machine tool, therefore any variation in their operation may give rise to decided variations in the rate of production. In most cases machine operating speeds will be lower than the speed of the motor or other driving element, hence the necessity for the more or less intricate trains of reduction gearing. One of the best examples of this is found in the lathe headstock.

Inasmuch as the lubrication of gears will depend, to a large extent, upon not only their design and construction, but also upon the design of the machine, it is well to look briefly into just what conditions are involved. The gist of proper gear lubrication may be said to embody the maintenance of a sufficient film of lubricant on the wearing surfaces of the teeth. This can be attained either by means of fluid oil or a more inert form of lubricant according to the means available for application. Oil lubrication, in general, will be relatively automatic in that only will it be possible where the gears are contained in some form of oil-tight casing or housing. In such instances a certain amount of oil can be maintained in the case, the gears dipping therein to a sufficient extent to afford the teeth an opportunity to carry or splash the necessary supply of oil to those of the train which are located above the oil level, and also to their shaft bearings where necessary. Another popular method whereby

(*Continued on page* 50)

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CRANES HOISTS

"RAISE PROFITS"

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"Our 650 men keep the 3 Euclids busy 24 hours per day."

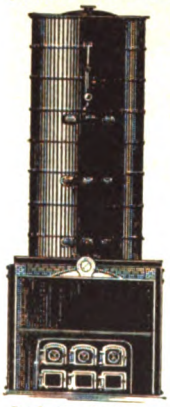
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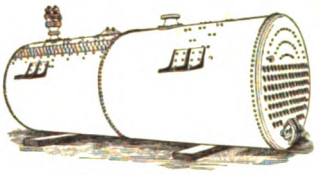
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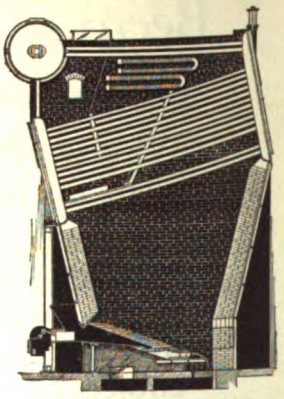
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Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

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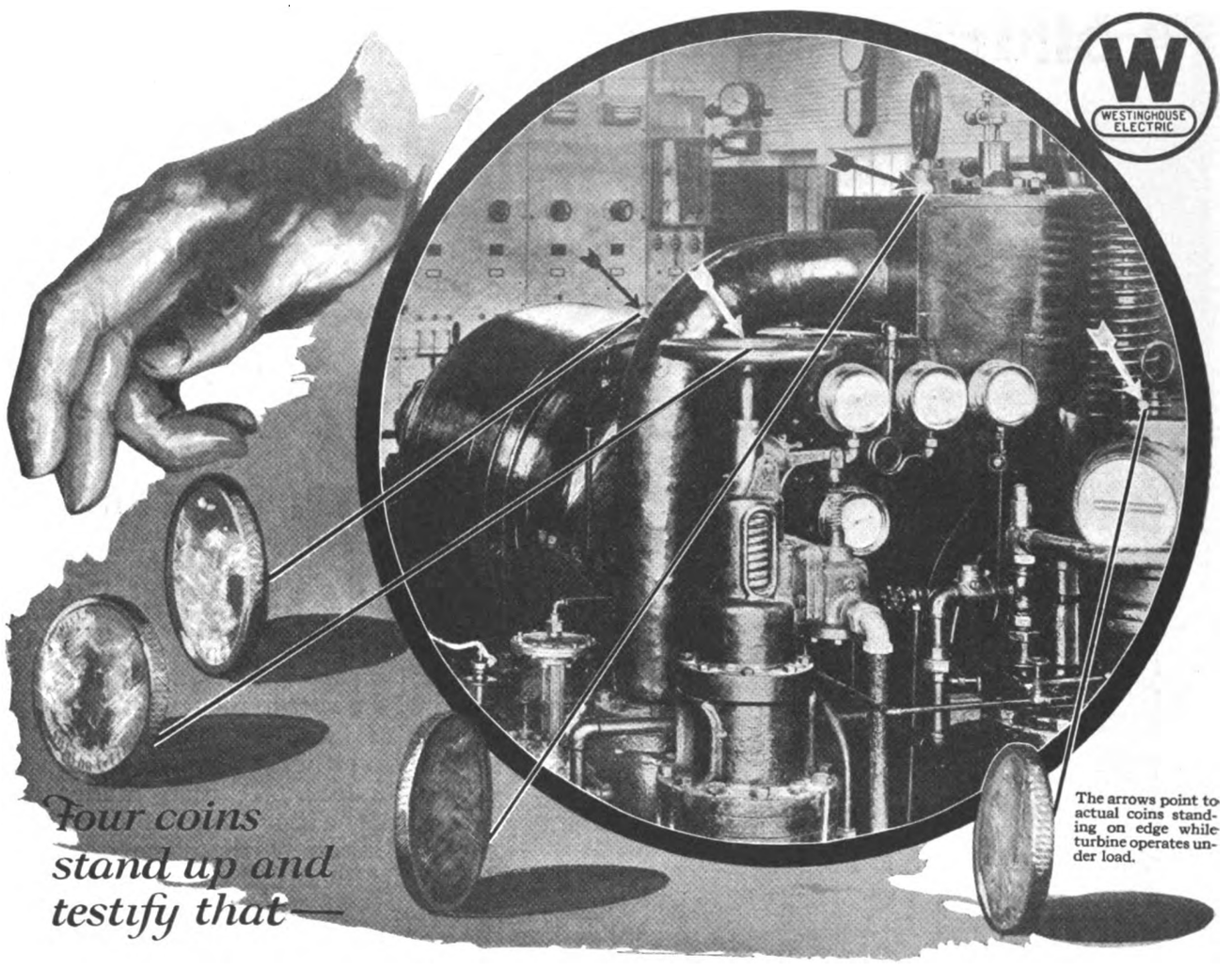
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A well balanced turbine reduces vibration to a minimum, which means lengthened life of the turbine.

Westinghouse turbines are balanced *dynamically* by special machines designed and built by Westinghouse. Equally important, this balance is maintained in service because the rotor is a solid steel, one-piece forging, short between bearings, and with large diameter shaft ends in which the unit stresses are low.

The Steam Turbine with the Solid Steel Rotor



Balance like this puts money in the pocket of the owner of Westinghouse apparatus. All the more reason for using coins to demonstrate the high degree of Westinghouse turbine balance.

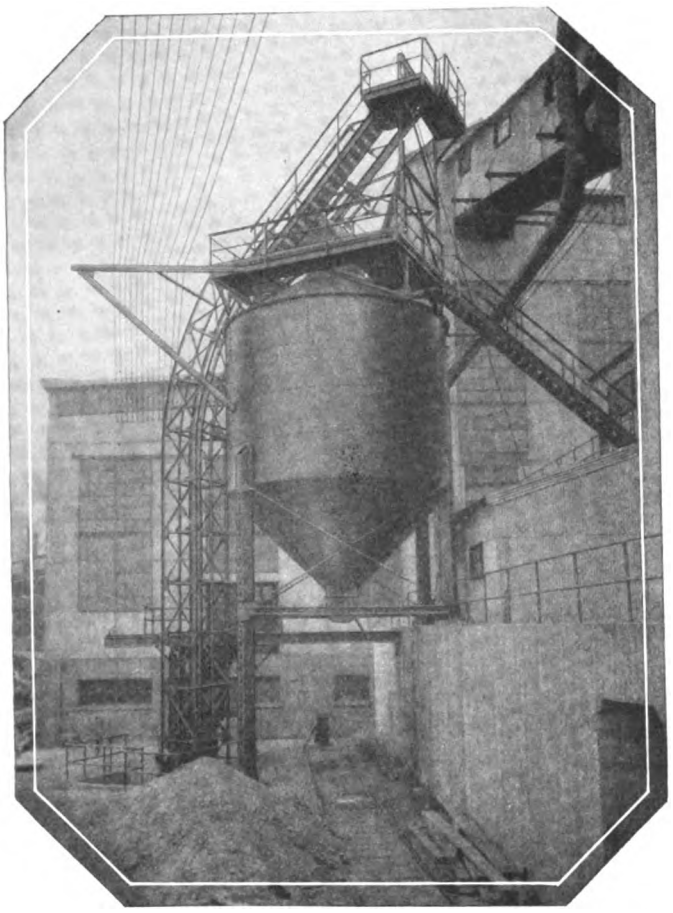
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A SIMPLE AND ECONOMICAL MEANS *for Handling your Ashes*



The Webster ASH-SKIP HOIST

The Webster Ash Skip Hoist provides the most efficient means of handling hot or cold ashes in either large or small boiler houses. It also makes possible the handling of oversized clinkers without need of breaking them up.

After the ashes have been dumped into the skip bucket, they are carried up and dumped into an overhead storage bin from which they can be discharged into railroad cars. The skip bucket is hoisted up to the storage bin by an electrically driven hoisting unit which is automatically controlled from the boiler room by a push button control. Almost every human effort is thus avoided which secures desirable results and helps to keep the operating cost low.

Many Webster Ash Skip Hoists are now in use, handling ashes in simple manner at an ultimately low cost.

We design and manufacture skip hoists to suit the capacity and operating conditions of any boiler house and to fulfill every ash handling requirement.

THE WEBSTER MFG. COMPANY
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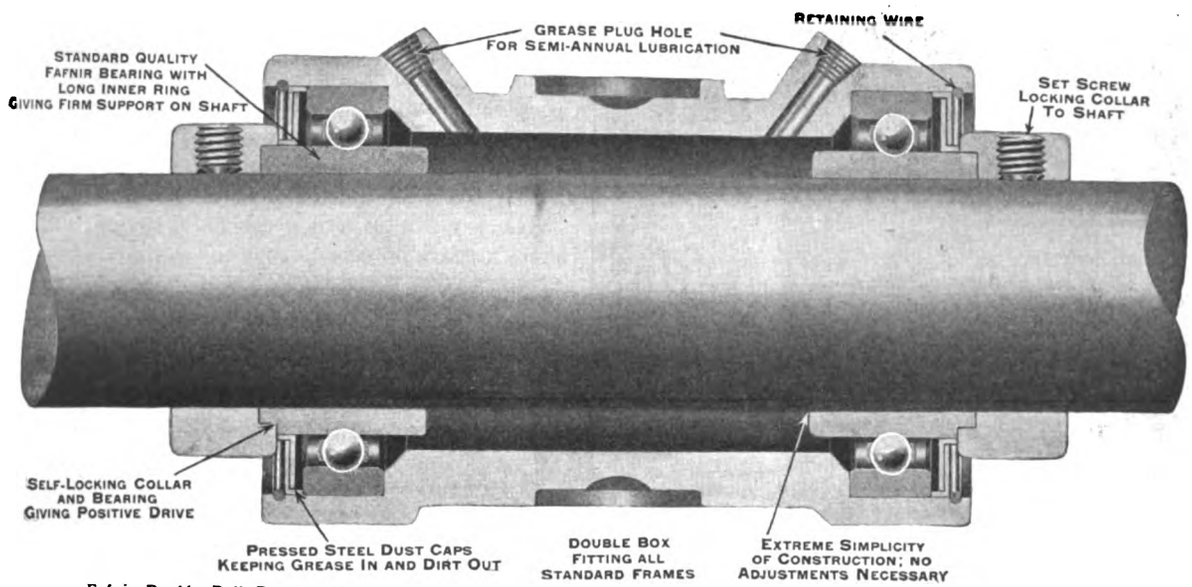
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Fafnir Double Ball Bearing Hanger Box. A similar construction is used in all Fafnir Transmission Equipment.

Six Major Economies With Easily-Installed Fafnir Hanger Boxes

THE economies given below are available to every plant, for Fafnir Ball Bearing Hanger Boxes are not only used in new plants, but by fitting all standard frames can replace plain bearings in all plants.

These major economies are—

1. **15% and upwards in power saving.**
2. **Greatly reduced maintenance expense.**
3. **Small lubrication costs.**
4. **Elimination of dripping oil.**
5. **Reduction of fire hazard.**
6. **Increased life with minimum attention.**

We can give names of actual plants where these economies are being made. Write for them.



This plant contains the largest ball bearing hanger box installation in the State of Maine—entirely Fafnir. It is one of the plants of the Goodall Worsted Co. at Sanford.

THE FAFNIR BEARING COMPANY

DETROIT **NEW BRITAIN, CONN.** **CHICAGO**

Makers of high grade ball bearings—
the most complete line of types and sizes in America



FAFNIR
BALL BEARINGS

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(*Continued from page* 44)

gears can be lubricated with oil involves force feed lubrication. In this way oil can be delivered to the gear teeth in streams of sufficient volume to maintain the requisite film of lubricant thereon. Force feed or pressure lubrication will usually develop a sufficient amount of splash to also take care of the bearings within the gear case, although on some machines the oil may be piped to them directly from the lubricator or oil pump in the reservoir.

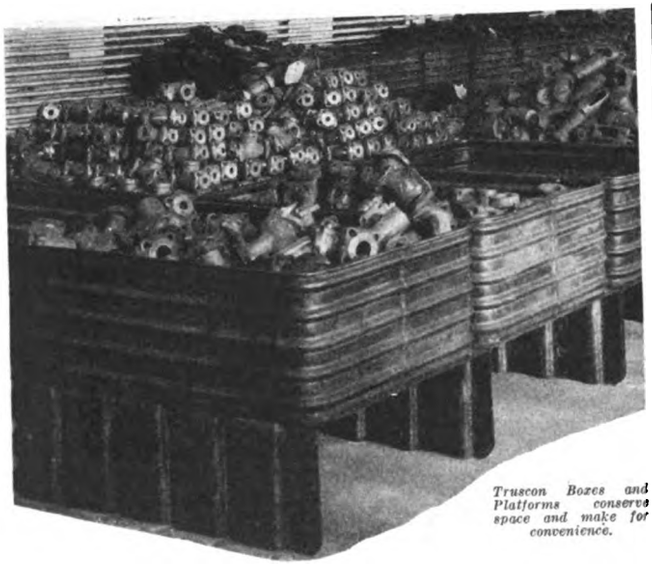
Where machine tool gears are exposed, such as are the back gears on certain types of engine lathes, or where the gear casing is not oil-tight it will usually be necessary to apply the lubricant directly to the teeth. In such instances it will be practically always necessary to use a heavier or more viscous gear lubricant inasmuch as the lubricating film will have to function for a much longer period in the prevention of metal-to-metal contact. For best results such a product should, therefore, be able to stick tenaciously to the teeth and resist the action of centrifugal force and the entry of foreign matter. There are numerous products of this nature available today, ranging all the way from the semi-fluid greases to the heavy napthenic base compounds so extensively used in the steel plant and rubber works. Some of them would, of course, be too inert and viscous for use on the lighter, more finely cut gear trains in the average machine tool, inasmuch as they would lead to the consumption of altogether too much power to operate them. To be true, they would lubricate, but also, they would impose a decidedly abnormal amount of drag.

In selecting a gear lubricant considerable care must therefore be exercised. In brief it should be as light or fluid as possible, commensurate with the tooth pressures involved and the means of application available. In splash, bath and pressure lubricated system a medium bodied machine oil is usually the best selection. An added advantage is also derived by the use of such an oil in that the one lubricant can generally be used on all the other wearing parts such as external bearings, guides and slides. In many cases of cutting it can even be readily used as an effective cutting fluid, thereby eliminating the necessity for stocking a cutting oil, and the possibility of careless operators mixing up the oils in application.

The relative importance of gearing on certain types of machine tools is forcibly brought out by the fact that certain authorities are prone to classify the machines according to their type of drive. For example the planer is very often referred to as being spur, helical or worm gear driven. In this machine, however, the spur or helical gear is generally preferred. The construction of a planer drive is decidedly interesting inasmuch as it is in reality the heart of the machine, the "bull gear," and rack which extends under the entire length of the table being the salient mechanisms. The arrangement of the intermediate gearing by which speed reductions are attained is also of interest, due to the fact that in the planer there must usually exist a difference between the cutting and return speeds, the latter being from two to four times greater than the former as a general rule.

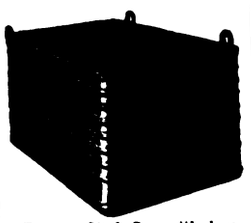
So, of course, planer gears require the most careful lubrication, for undue wear of the teeth, the occurrence of "backlash" or pounding or hammering may affect cutting to a marked extent. It is for this reason that so many builders prefer bath lubrication, or the installation of some form of pressure system which will insure a

(*Continued on page* 52)



Truscon Boxes and Platforms conserve space and make for convenience.

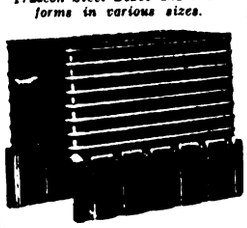
Day After Day They Pay



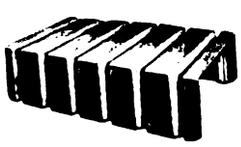
Truscon Steel Box with lugs for crane handling.



Truscon Steel Boxes and Platforms in various sizes.



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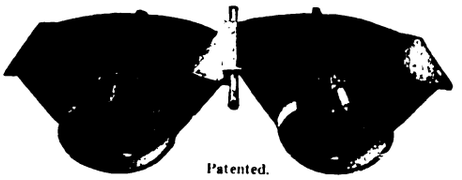
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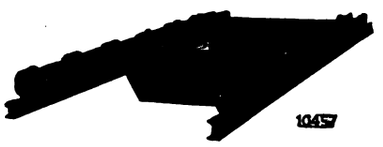
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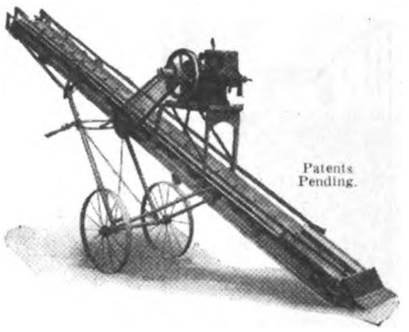
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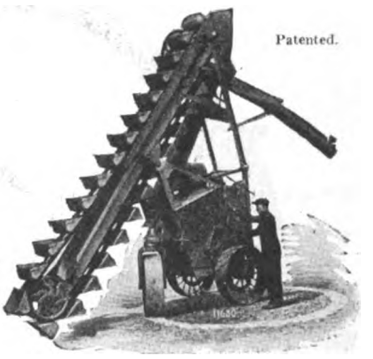
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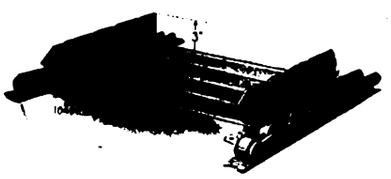
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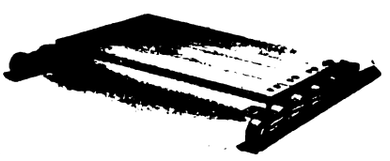
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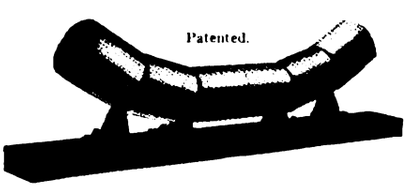
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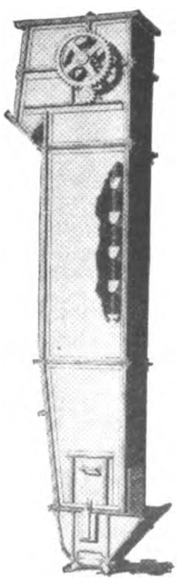
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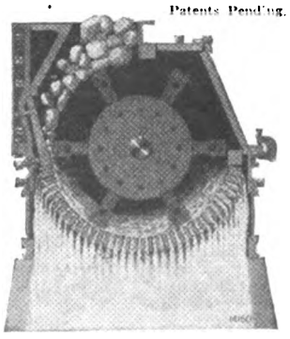
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MATERIAL HANDLING EQUIPMENT

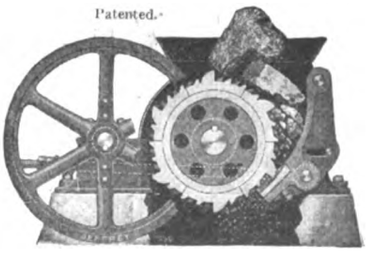




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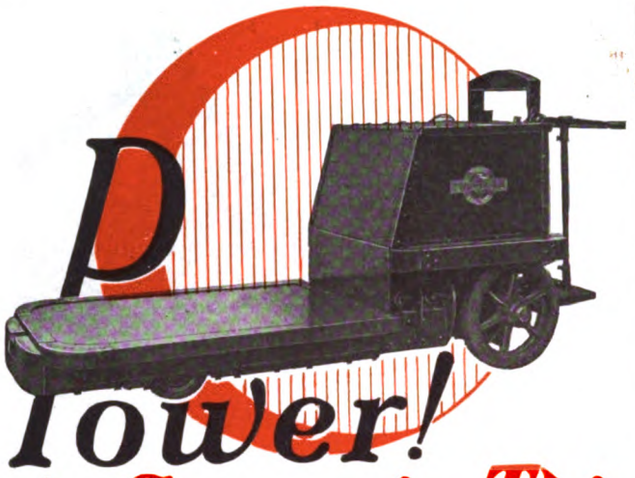


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(*Continued from page* 50)

generous flood of oil over the gear teeth at all times. In this way the noise of reversing gears, which is so often prevalent on certain types of planers due to clashing of the teeth when the direction of rotation is brought about, can be considerably reduced. In other words, not only does the lubricating film serve as an eliminator of solid friction, but also as a buffer, shock absorber or silencer. Too, the reduction in these shocks of reversal, of course, will promote greater durability of all the wearing parts which would be directly affected.

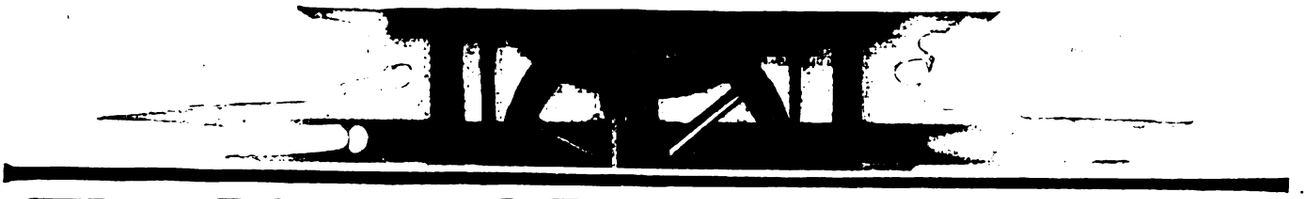
In regard to bearings, it is of interest to know that quite a number of types may be involved in modern machine tool design. The plane babbitted bearing, however, is perhaps the most generally used, although anti-friction bearings of the ball or roller type are coming more and more into usage. Then, too, there are the thrust bearings on such machines as the lathe, the functions of which are to take up the end thrust exerted by the spindle, etc. Of all the wearing parts involved bearings are, perhaps, the most susceptible to the development of abnormal friction in event of improper or insufficient lubrication. Too frequently are we prone to overlook this fact in the belief that because operating conditions may be somewhat detrimental, any attention paid to the bearings is more or less of no avail. In reality, however, in the interests of maximum production, it is virtually impossible to give too much attention to lubrication. We would not run our automobile without oiling. In fact many of us give it too much oil. Then why skimp or disregard the importance of lubrication in our machine tools. If our car breaks down, the trolley or bus is available; if a lathe spindle bearing burns out, however, we may fall down on an order and Blank & Company will get the next contract. In other words, the machine tool industry, from the management to the helper, has too much at stake to disregard that factor which keeps their machines running effectively, enables them to attain maximum production and a fat pay envelope.

As has already been stated in our discussion of gearing, certain of the gear shaft bearings and many other bearings will be so enclosed that they can be automatically lubricated by splash or force feed lubrication simultaneously with the gear teeth. Some manufacturers carry this one step further and design their oiling systems with leads to the more important bearings and slides without the casing. In the development of lathes, planers and milling machines the preference of some means for centralized forced feed lubrication has been decidedly marked. On deep cutting of high speed and alloy steels the pressures exerted on certain of the bearings and gears will be relatively high. Where the clearances are fairly large and an oil of sufficiently high viscosity is used, the lubricating film will be thick enough under ordinary conditions to prevent abnormal wear.

High clearances, however, may defeat the attainment of accurate cutting to the necessary extent. Therefore they are not desirable on machine tool bearings where fine work is involved. Instead, pressure lubrication has been found to serve the purpose best. Too, a lighter grade of oil can be used effectively, if the pressure on the lubricating system is sufficient to force it to all wearing parts involved. Of course, a splash or bath lubricated system would involve little or no pressure.

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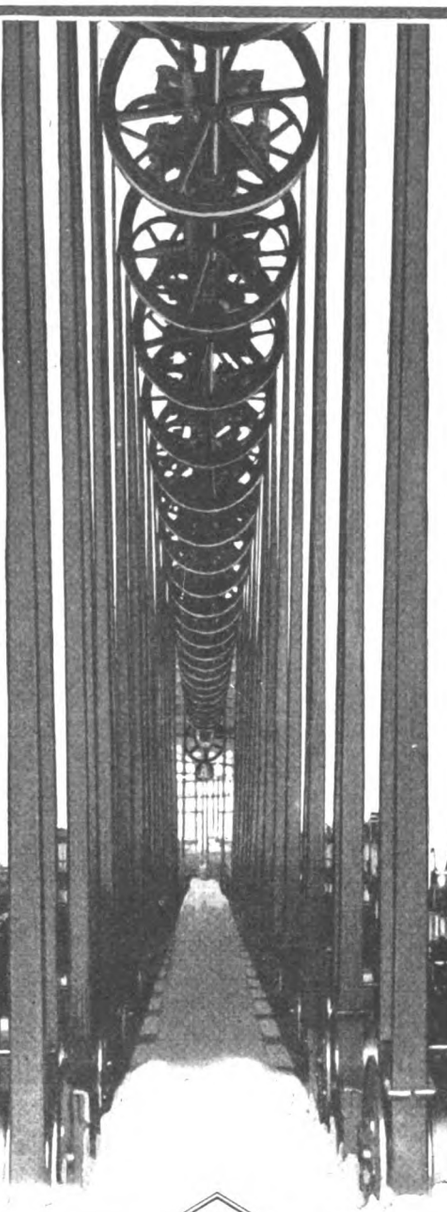
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(*Continued from page* 52)

The extent to which a centralized lubricating system would have to be planned would, of course, depend upon the nature of the work involved, the pressures, as stated above, and the design of the machine itself. Some builders of milling machines for example, have found that the installation of oil reservoirs of sufficient capacity, or independent force feed lubricators not only simplify their problems of design and construction, but also afford the necessary lubrication even though flood lubrication may not be developed.

In contrast, other manufacturers regard flood lubrication as a practical necessity, with the result that their machines are equipped with absolutely self-contained oiling systems the lubricant being pumped to the bearings,

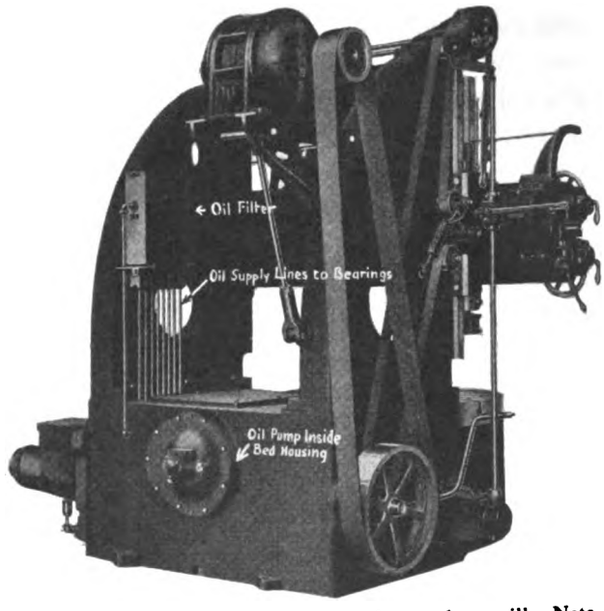


Fig. 12. The lubricating system of a modern mill. Note the oil filter, the oil pump inside the bed housing and the oil supply lines to the bearings.

gears and slides by means of a pump contained either in the oil reservoir itself, or located adjacent thereto.

Slides or guides while usually fewer in number than bearings and gears, nevertheless play an important part in the effective operation of a lathe, planer, shaper, etc. Take the lathe for example: here we have the bed on which the carriage moves, with its necessary V's which serve to keep the carriage in proper position, and the guides on which the turret saddle and cross-slide carriage travel.

While motion over the average machine tool sliding surface will be relatively slow, in many cases the pressures will be high. Especially is this true on certain horizontal machines such as the engine or turret lathe, the planer, etc. As a result wear frequently tends to become excessive in case such surfaces are not properly lubricated; and, just as wear might increase so might the demands for power.

V-lubrication is generally given considerable attention, not only by the builders of lathes and planers, etc., but also by the oil man, for it is a phase of the general problem of lubrication which can easily develop difficulties which may affect both. For example, metal-to-metal contact on a lathe bed may tend to cause it to wear hollow, with the possible occurrence of mis-alignment.

(*Continued on page* 56)



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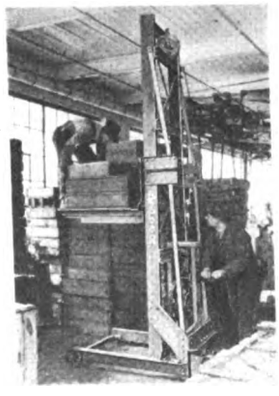
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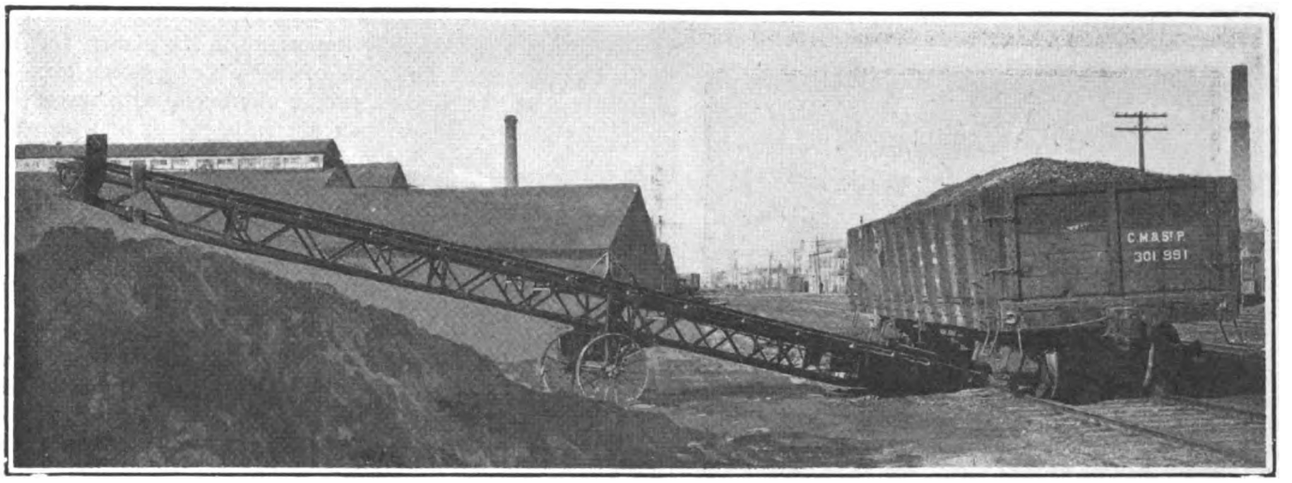
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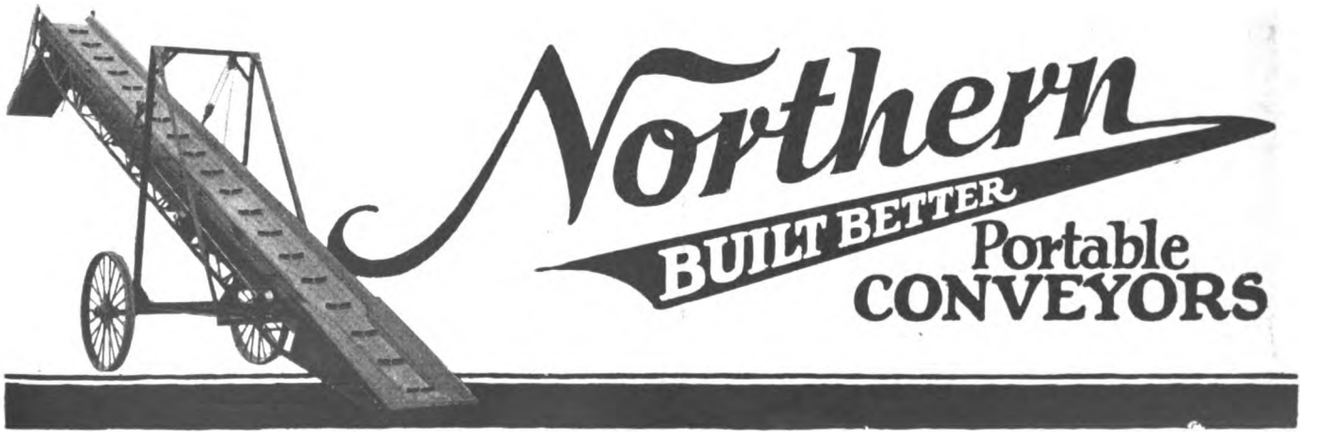
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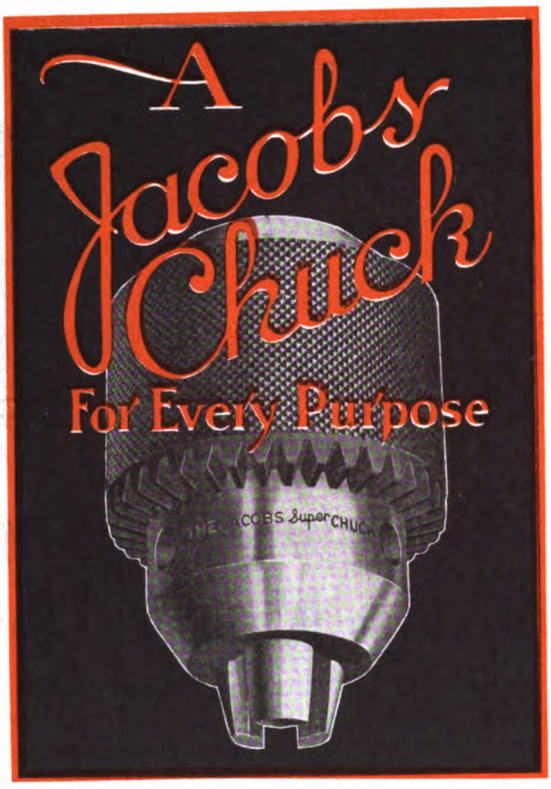
This latter is especially important on the planer, for one of the essential functions of the V's or guiding grooves is to keep the table in proper alignment with respect to the cutting tool. In fact upon the extent to which the V's of a planer maintain alignment will depend the accuracy of the resultant cut.

As a result pressure lubrication has been adopted by certain builders, and splash lubrication by others, although, in addition the oil can is still the "piece de resistance" in the hands of many an operator. A modern pressure lubrication system generally serves not only the V's but also the guides, bearings and adjacent gearing. Another method is to attach felt wipers to the sliding elements, saturating them with oil at frequent intervals. Wipers are advantageous not only because they afford effective lubrication, but also due to the fact that they serve to keep the V-grooves clear of dirt and thereby prevent scoring of the wearing surfaces. Still another method of V-lubrication, which is found on many lathes, etc., involves a number of wheels or discs free to revolve, which are located in depressions or reservoirs in the V's, being held in close but not rigid contact with the V-shaped projections on the sliding elements. So as the latter slides over them they rotate and carry a film of oil to it from the reservoir below in much the same manner as would a ring oiler on a rotating bearing.

While the lubricating systems mentioned above are in effect parts of the machine itself, we must not overlook the fact that the independent force feed lubricator can also be readily adapted to this service. Such a lubricator, with its self-contained oil pumps and reservoir can be readily attached to an existing piece of equipment, with practically no alteration of the arrangement of the operating mechanisms. In fact all that will usually be necessary will be to install it at the proper level, and run the necessary oil piping from the respective pumps to the parts to be oiled. A decided advantage of the independent force feed lubricator is that the flow of oil to each part can be controlled individually, with the result that more nearly the correct amount of lubricant can be supplied in each case, just as is true of the sight feed oil cup which, of course, will always be used to a certain extent on external guides and slides.

Where oil is to be used as a general machine lubricant, as will be the case where pressure, splash or individual oil is called for, it is usually possible to serve all the wearing parts with the one grade of oil, provided they are suitably enclosed. In such cases a machine oil, of the viscosity or body of a medium automobile engine oil will be suitable. Machine oils, however, need not be as highly refined products as would be required for the automobile engine, hence their cost ought not to be as high.

Grease lubrication is another important factor which must not be overlooked. In certain instances the compression or pin type grease cup will be the most economical equipment to use, with a grade of grease having a consistency commensurate with the temperatures involved and the mechanical construction of the cups. The pin type of cup has been very successfully installed on certain types of lathes and on high speed grinder bearings.



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(*Continued from page* 25)

switch from one field to another and from one problem to another and to demonstrate his capabilities each time so clearly that a bigger job has always opened up ahead of him. Alvan Macauley, president of the Packard Motor Car Company, has been—or rather is—a lawyer, an inventor, an engineer, a production man, a master salesman, an advertising expert, an organizer, and chief executive, and he has excelled in each capacity.

Macauley, of Packard Motor Car, is rightly listed with Judge Gary, of U. S. Steel; Judge Lovett, of the Union Pacific; Hale Holden, of "The Burlington"; H. R. Kurrie, of "The Monon"; E. W. Beatty, of the Canadian Pacific; A. R. Graustein, of Mergenthaler and International Paper; John S. Runnels, and his predecessor, Robert T. Lincoln, of the Pullman Company; C. F. Kelley, of Anaconda Copper; Owen D. Young, of General Electric; and the late Col. S. P. Colt, of U. S. Rubber; all former attorneys who gained fame as industrial leaders; for Macauley took his degree in law at the age of twenty and for five years was "a bright young patent attorney" at Washington, D. C.

It was his work as a patent attorney, in fact, that started him on the road to industrial leadership. As the Washington associate of a Chicago firm of patent attorneys, he attracted the attention of Edward Rector, who recommended him to one of his best clients, the National Cash Register Company, as patent attorney.

Macauley took the job and doubtless was mighty glad to get it. The National Cash Register Company at that time had something for a patent attorney to do, all right, and Macauley was a good patent attorney. He was more than just a patent attorney, however, and he had no more than become intimately acquainted with his new duties till he was slipping out into the plant at odd moments and "watching the wheels go 'round."

Just here it should be explained that, before taking up law, Macauley had studied engineering for two years at Lehigh University. Contact with a manufacturing Company doubtless rekindled this first love and he began making a study of the engineering work of the National Cash Register Company. It wasn't long before he was suggesting improvements in the product and from this the young patent attorney began working out inventions of his own to patent.

One of the chief secrets of John Patterson's success was his ability to find and develop talent in others and he was not long in finding Macauley. He encouraged his young attorney to take advantage of the opportunities his plant offered and, after Macauley had been there about two years, employed another patent attorney to take care of the routine patent work and placed Macauley in charge of the engineering and inventions, while he continued to direct the work of the patent attorney's office. In all, this young attorney contributed twelve patents to the National Cash Register, some of which are still incorporated in the product. Incidentally, he learned much from John Patterson.

In the meantime, Edward Rector was watching the progress of his protege, and when he was asked to recommend a general manager for the American Arith-

(*Continued on page* 60)

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CLEVELAND HAND OR ELECTRIC TRAMRAIL

One man now does the work of six

ONE man—*and a Cleveland Electric Tramrail system*—handles material for every department of the plant shown below. Long pump sucker rods make an unwieldy and difficult load to handle, yet Cleveland Tramrail does the work successfully.

One man now unloads raw materials, keeps every machine supplied for full time production, moves finished rods to storage and loads cars for shipment.

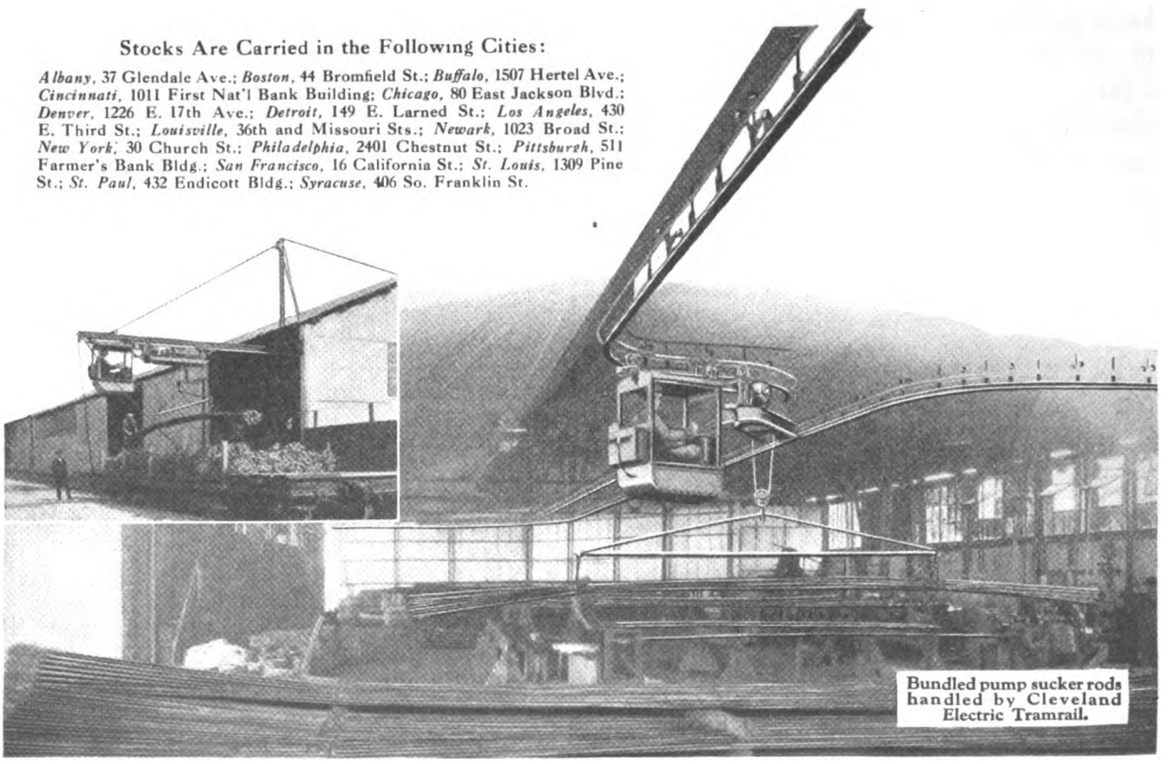
Savings in wages of five men, increased production from machines, no more car demurrage—have more than paid for the entire installation the first year.

Write for our 225 page book on modern handling methods.

Cleveland Electric Tramrail
Division of
The Cleveland Crane and Engineering Co.
Wickliffe, Ohio

Stocks Are Carried in the Following Cities:

Albany, 37 Glendale Ave.; *Boston*, 44 Bromfield St.; *Buffalo*, 1507 Hertel Ave.; *Cincinnati*, 1011 First Nat'l Bank Building; *Chicago*, 80 East Jackson Blvd.; *Denver*, 1226 E. 17th Ave.; *Detroit*, 149 E. Larned St.; *Los Angeles*, 430 E. Third St.; *Louisville*, 36th and Missouri Sts.; *Newark*, 1023 Broad St.; *New York*, 30 Church St.; *Philadelphia*, 2401 Chestnut St.; *Pittsburgh*, 511 Farmer's Bank Bldg.; *San Francisco*, 16 California St.; *St. Louis*, 1309 Pine St.; *St. Paul*, 432 Endicott Bldg.; *Syracuse*, 406 So. Franklin St.



Bundled pump sucker rods handled by Cleveland Electric Tramrail.

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(*Continued from page* 58)

mometer Company (later the Burroughs Adding Machine Company), he named Macauley.

A New Job—And a Real One

Macauley hesitated. He had been with the National Cash Register Company for seven years and was doing well there. Should he relinquish the certainties of his present position for the uncertainties of another? In his quandary he went to Patterson and Patterson, in his unselfish way, advised him to take the new job. That this was unselfishness is indicated by the telegram Patterson sent Macauley on the occasion of the latter's promotion to the presidency of Packard, in which he declared that he was: "Proud to know that you have fulfilled the prophecy I made when I helped you to decide to go with the Arithmometer Company many years ago."

Macauley had no sooner taken up his new duties with the Arithmometer Company, which was then located in St. Louis, than he found that he had not been employed at the suggestion of the president and that he had stepped into the midst of a hard fight for control of the company. Had he not definitely severed his connection with the N. C. R., it is likely that he would have turned around and gone right back, but as it was, he had to make the best of the situation, which was about as bad as any such situation well could be. Within a month after he joined the company, the president was ousted and took with him fifty-two skilled men, leaving Macauley just one man who knew how to build an adding machine.

To say that the situation was critical would be putting it mildly. There was a rebound, however, and Macauley was quick to take advantage of it. When the retiring president took fifty-two new men to the company that had engaged him, he had to make room for them and it was only natural that some of the old men who were let out or who were dissatisfied should come over to Burroughs. These Macauley employed and with them as a nucleus, soon succeeded in rebuilding his organization.

The next step was to improve his product and in looking about for someone to take charge of this work, Macauley selected a young toolmaker by the name of Vincent. A little later Vincent was made chief engineer and he has been Macauley's chief engineer ever since, for the bright young toolmaker was none other than J. G. Vincent, now vice-president in charge of engineering of the Packard Motor Car Company and one of the foremost authorities on aerial power plants, as well as on automotive engineering.

By 1905, the company had outgrown its plant and began to lay plans to expand. It bought an adjoining piece of property and planned to erect a new building thereon, connecting it with the old building by means of an overhead bridge across an alley. Just about the time the contract was to be let, however, the city council declined to permit bridging of the alley. This, doubtless, was due to politics and Macauley and his associates determined to get out of St. Louis.

Detroit was selected as the new home of the company and the Burroughs was the first of the many fireproof plants to be built in the motor city. The new factory was erected in record time, arrangements were made for housing the 450 employees of the company, and one night two trainloads of workmen, their families and furniture, and machinery left St. Louis for Detroit. Everything,

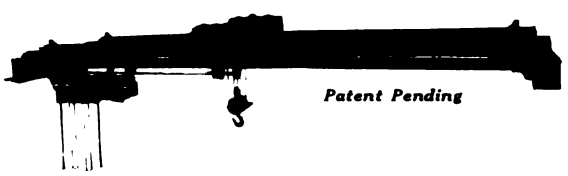
(*Continued on page* 62)



Have You Been Putting off the Purchase of an Overhead Travelling Crane?

No need of doing so any longer — Our

Standardization IN



CRANES

makes it possible for you to have just what you want and need—A high grade, quality crane at a price within your reach. And it possesses features not found on any other crane—exclusive features which will lower your maintenance and operating costs as well as any contemplated building costs.

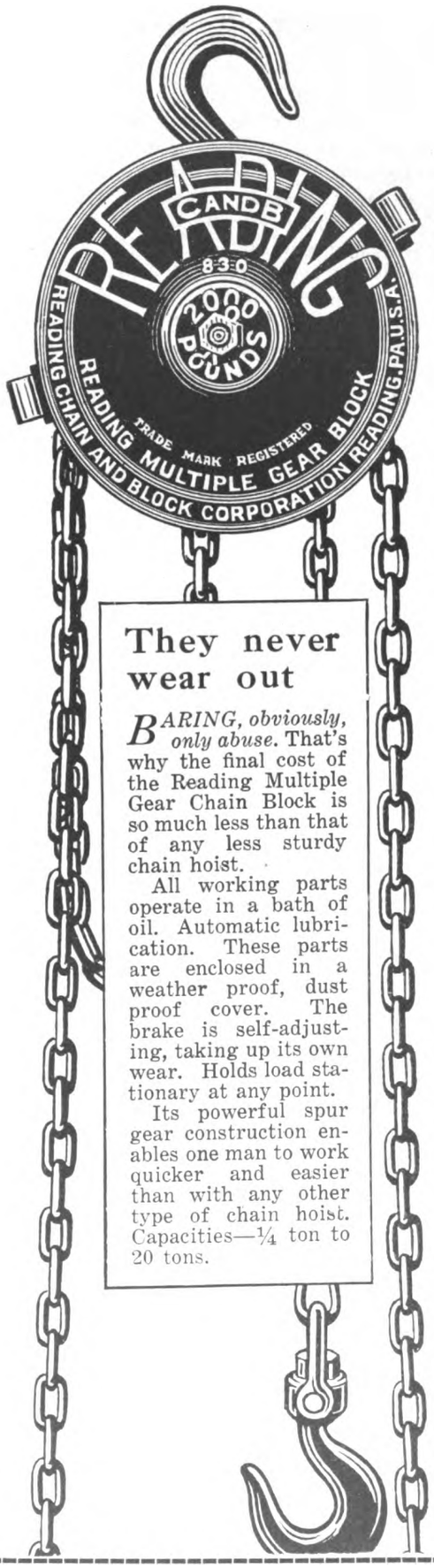
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630 Monadnock Block, Chicago, Ill.
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They never wear out

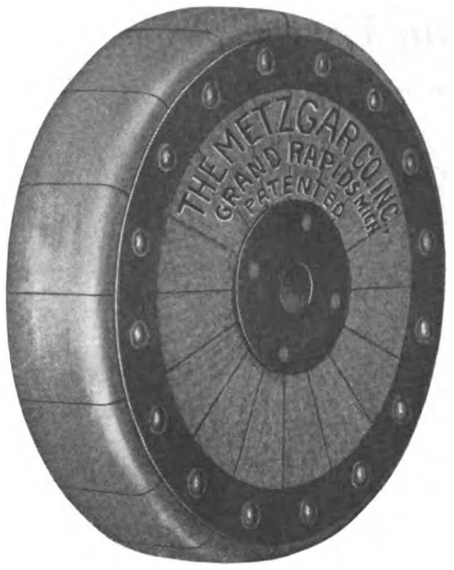
BARING, obviously, only abuse. That's why the final cost of the Reading Multiple Gear Chain Block is so much less than that of any less sturdy chain hoist.

All working parts operate in a bath of oil. Automatic lubrication. These parts are enclosed in a weather proof, dust proof cover. The brake is self-adjusting, taking up its own wear. Holds load stationary at any point.

Its powerful spur gear construction enables one man to work quicker and easier than with any other type of chain hoist. Capacities—¼ ton to 20 tons.

READING CHAIN & BLOCK CORP.
2140 Adams St., *Reading, Pa.*

Gentlemen: Please send me your free booklet. My name, company name and address is written in the margin of the magazine below.



LET

Metzgar Wheels

Solve That Floor Problem

They may cost a little more than iron wheels in the beginning, but they are a whole lot cheaper in the "Long Run."

You can specify Metzgar Wheels on all new trucks as well as for replacements. All leading truck builders are supplying them on orders.

Metzgar Wheels are made in all sizes for all makes of trucks.

Write for full particulars and let us quote you on your requirements

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GRAND RAPIDS ~ MICHIGAN, U.S.A.

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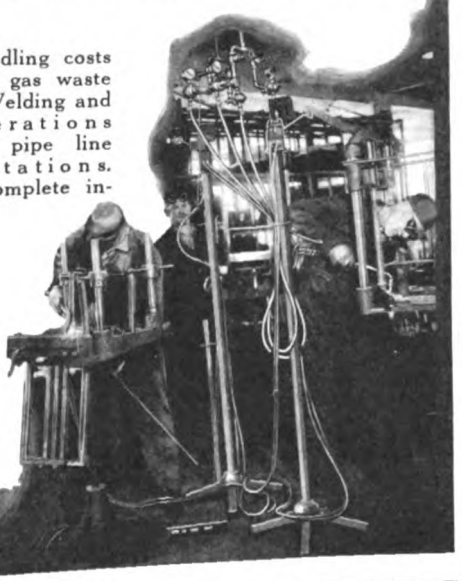
Scan Your Oxygen Bills!

If your oxygen gas requirements exceed 8,000 cu. ft. per day and you are buying oxygen in cylinders, you can now slash the cost of oxygen 50%.

OXECO LIQUEFACTION OXYGEN PRODUCING PLANT

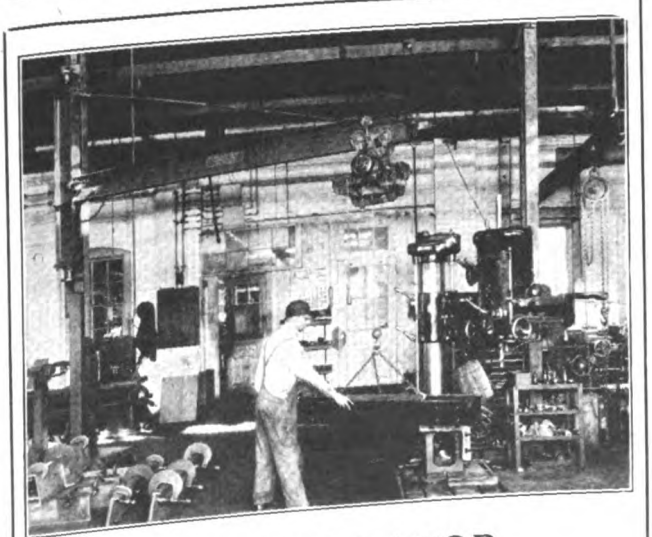
The simplest and most efficient means of producing oxygen from the air guarantees a supply of 99.5% pure oxygen at a fraction of the cost of oxygen in cylinders.

Cylinder handling costs and cylinder gas waste eliminated. Welding and cutting operations speeded by pipe line service to stations. Write for complete information.



KEITH DUNHAM COMPANY

110 So. Dearborn St., Chicago, U. S. A.



LIGHTEN LABOR WITH ROEPER ELECTRIC HOISTS

Keep the machines active so they produce the utmost. The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

Ask for full information.

ROEPER CRANE & HOIST WORKS, Inc.

1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys

(*Continued from page* 60)

"lock, stock, and barrel," except the building, was moved bodily to Detroit and in less than a week, the Detroit plant was shipping adding machines.

When Macauley became general manager of the old Arithmometer Company, it was estimated that about 8,000 machines would be the saturation point in the adding machine field; when he left, nine years later, the company had produced over 400,000 machines. When he took charge, the company employed about 250 men; when he left it employed over 6,000 men.

The Burroughs is recognized by authorities as one of the three leading sales organizations and that it is such is due almost entirely to the fact that Macauley applied here what he had learned about selling while with that other marvelous selling organization, the National Cash Register Company.

In an article which he wrote for *Printers' Ink* some years ago, Macauley relates a number of instructive incidents which illustrate the fact that he was a pioneer in developing the principles of sales management. One of these was the switching of old salesmen to different territory when they thought they had exhausted the field they had tilled for several years.

"The territory had been on the toboggan for some time," he said, in speaking of one of these instances, "and was then at the bottom of the list of agencies in point of sales. Our experience, though, had shown that there isn't any such thing as a territory with all the prospects sold; at least not an adding machine territory. Of course, we weren't willing to abandon the territory, though leaving him in it would have been equivalent to doing so.

"So we gave him another territory—where he didn't know the prospects that couldn't be sold. And we transferred to his old Toledo territory a man who didn't know that the business houses there had all the adding machines they needed, nor even believe it.

"Within three months more machines were being sold in the Toledo territory than had *ever* been sold there, and before long the new manager had worked up to the top of the list of quota-getters—in a 'dead' agency.

"The old manager also had made good in his new territory. He didn't know those of his new prospects who couldn't be sold, so he took their orders as the easiest way of getting acquainted.

"Since I have been with the Packard I have had ample opportunity to test this idea further. A territory that is now very near the top in Packard sales, the Chicago agency, is managed by a man I sent from Detroit to put in charge of sales in that territory.

"Chicago sales were good before. If they had been judged only in dollars, and not in proportion to possible sales, they would have looked very well indeed. But when the opportunity came to change the agency, I brought in the Detroit man, who didn't know Chicago at all.

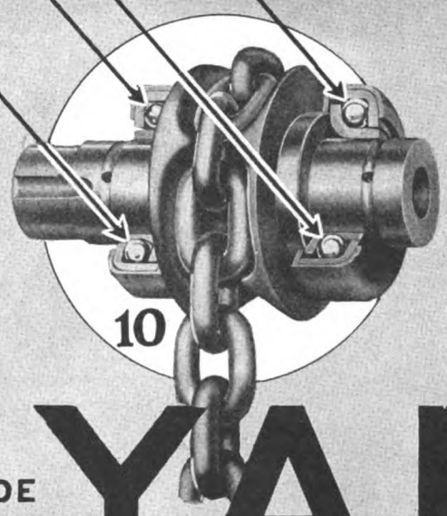
"He didn't know who was a prospect for a Packard car or for a Packard truck, except as he studied each man's individual needs and individual means of buying. The result was that he sold many men and firms who never would have been seriously approached.

"Chicago sales have tripled since the change was made."

(*Continued on page* 64)

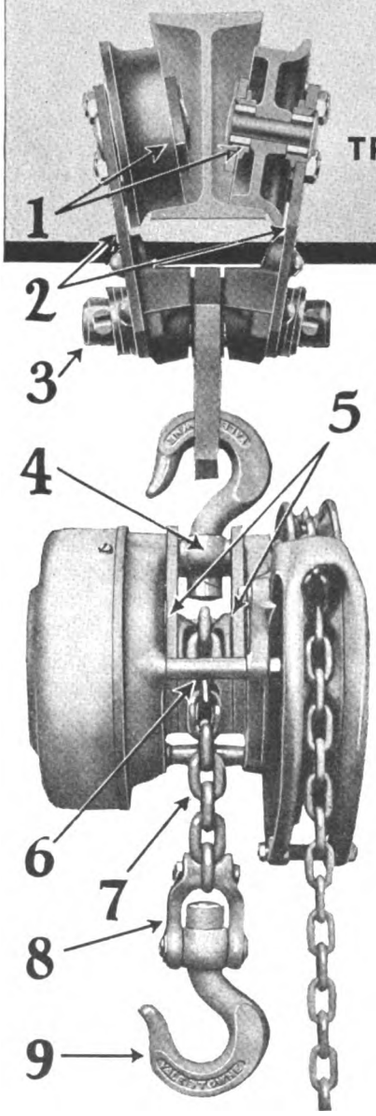
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The Yale Load Sheave



YALE
Chain Blocks, Electric Hoists } For Lifts
I-Beam Trolleys, Industrial Trucks } For Shifts

TRADE YALE MARK



for Greater Service

The Yale *Ball Bearing* Spur-Geared Chain Block lifts more easily, with a lighter hand-chain pull, because friction has been reduced where friction *was* greatest.

It gives greater service because the wear on load-sheave bearings has been greatly lessened by the Yale smooth-rolling chrome-vanadium steel ball bearings.

The Yale Block is more efficient because less muscular energy is required to lift the load.

A better block has never been made. Yale again lowers the cost of hoisting.

Yale Ball Bearing Spur-Geared Blocks with Yale Roller Bearing Trolleys insure low-cost service and the highest degree of safety.

1 Steel Roller Bearings
2 Steel Side Plates
3 Steel Equalizing Pin
4 Steel Safety Hook and Crosshead
5 Steel Suspension Plates
6 Steel Load Sheave
7 Steel Load Chain
8 Steel Detachable Shackle
9 Steel Safety Hook
10 Steel Ball Bearings

—a line of steel from hook to hook.

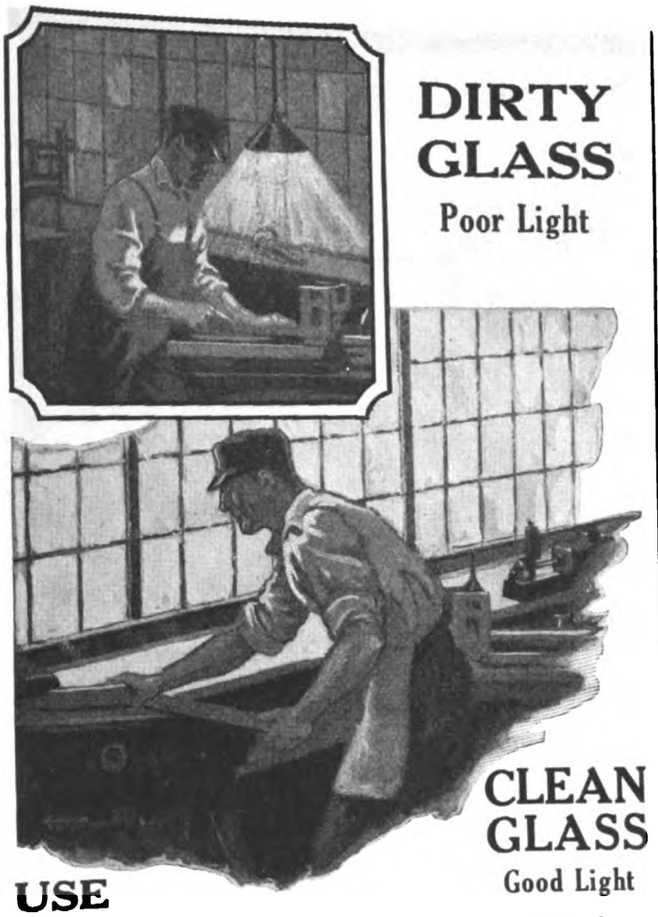
Yale material handling equipment includes Spur-Geared, Screw-Geared and Differential Chain Blocks, Electric Hoists, I-Beam Trolleys and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment. To acquire locking control, security and convenience throughout the factory use Yale Master Keyed Locks.

The Yale & Towne Manufacturing Co.
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YALE MADE IS YALE MARKED

YALE **Hoisting and Conveying Systems**

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USE

DAYLIGHT!

and SAVE the Difference

Why buy electricity for lighting your plant when you can get Daylight for nothing? Just let the daylight in—clean off the winter's coat of grime and dirt on windows and skylights and flood your place with Nature's free sunlight. You'll save not only in illumination bills but also in greater production and less spoilage.

SKYBRYTE (LIQUID) CLEANER

SKYBRYTE, the National Glass Cleaner, *instantly* cleans the dirtiest glass—at ¾¢ per square foot!

An unskilled laborer coats the dirty glass with SKYBRYTE. The hardened crust of carbon scale, rust, soot and grease is dissolved. Flush off with water and glass is clean.

Skybryte is harmless to paint, putty or sash. Now used by hundreds of great manufacturing plants, steel mills and foundries.

The SKYBRYTE Company, Keith Bldg., Cleveland

Chicago Branch, Tower Building, 6 N. Michigan Ave.

TRIAL OFFER

The SKYBRYTE Company,
Keith Building, Cleveland, Ohio.

You may ship us five gallons of Skybryte on trial and one regular 75c Skybryte brush FREE. We will use enough to make a thorough trial—enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for five gallons skybryte at $3.00 per gallon, F. O. B. Cleveland.

Skybryte in bbls. $2.50 per gallon freight allowed.

Company.....

Street.....

City.....

(Continued from page 62)

With Packard Fifteen Years

In the spring of 1910, Henry B. Joy, president of the Packard Motor Car Company, who thirteen years before had helped bring the Packard Company to Detroit, invited Macauley to come over and be general manager of Packard. To induce him to accept, it is said that Mr. Joy supplemented the invitation with an offer of a larger salary than he himself was drawing as president.

Packard then was producing a four-cylinder car and was turning out about 2,000 units a year. It was not till 1915 that the famous "Twin-Six" was placed on the market.

Macauley assumed the duties of general manager of Packard on April 10, 1910. On July 24, 1913, he was made vice-president and retained his title of general manager; on May 10, 1915, he was elected a director, succeeding J. W. Packard, inventor of the car; and on June 16, 1916, he became president and retained the title of general manager. At the age of forty-four, he had become the head of a $30,000,000 corporation, employing 12,000 workmen, with an annual production valued at $40,000,000.

As early as the spring of 1915, it became apparent to far-sighted men that the United States very likely would be drawn into the World War and Packard, under the leadership of the then president, Henry B. Joy, began experimenting on aerial power plants, with the expectation that the time might come when the Government would suddenly be in need of a dependable aviation motor that could readily be produced in quantity.

On Sunday morning, May 27, 1917, President Macauley and his chief of engineering, Mr. Vincent, held a conference in the former's home, as a result of which the latter immediately set out for Washington, where he offered without reserve all the Packard aviation patents, experience, and facilities for the use of the Government.

Packard, up to this time, is said to have devoted two years of experimental work and to have spent approximately $400,000 in developing its aviation motor, yet all this was given free to the Government. Not only so, but at the suggestion of Colonel E. A. Deeds, Packard readily agreed to forego the use of its name in connection with the motor, in order to obtain the coöperation of other American manufacturers in producing what was later known as the "Liberty" motor.

Packard immediately began producing Liberty motors in quantity and had turned out two hundred of them before any other manufacturer produced one and before the Government had officially placed an order for the motors.

Mr. Vincent was loaned to the Government and was placed in charge of aircraft development; all experimental work on the Liberty motor conducted by the Government was carried on at the Packard plant, and, up to the signing of the Armistice, Packard built more than one-third of all Liberty motors accepted by the Government.

Since the war, Packard has continued to work toward the perfection of aerial power plants and even now claims the lightest aviation motor in existence. It built the motors of the Shenandoah and it has recently received Government contracts for several aircraft motors to be used in army and navy planes.

(Continued on page 66)

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Five - - - - MEN - - - - One
8 Hours - TIME TAKEN - 2 Hours
$20.00 - - TOTAL COST - - - $1.00
Tiresome - - LABOR - - - Easy
1 Car - - DAILY CAPACITY - - 4 Cars

SAVE PER TON - - 36c

CONVEYOR OPERATING AND UPKEEP COSTS GUARANTEED
LESS THAN 2c PER TON OF MATERIAL HANDLED.

NOTE—These Comparative costs are averages taken from reports received thru the courtesy of Thousands of Material Handlers who have used Scoop Conveyors for years.

THE FIGURES given illustrate—(1) the Money Saving (*added Profits*); (2) the Saving in Man Power (*elimination of labor troubles*); and (3) the Time Saving (*increased capacity—no demurrage charges*) which Scoop Conveyor Users effect.

ONE OF OUR REPRESENTATIVES WILL GLADLY CALL ON YOU TO DISCUSS YOUR PARTICULAR MATERIAL HANDLING REQUIREMENTS
CONVEYORS SHIPPED ON TRIAL—A YEARLY RETURN OF AT LEAST 50% GUARANTEED
COMPLETE LITERATURE AND PRICES CHEERFULLY FURNISHED

WRITE, PHONE OR WIRE

PORTABLE MACHINERY COMPANY PASSAIC N.J.

When writing advertisers please mention Industry Illustrated

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(*Continued from page 64*)

Americans First

President Macauley was one of the first to realize the necessity of taking definite steps to Americanize the millions of foreign-born who had found lucrative employment in American industry and on January 31, 1916, issued his "Americans First" proclamation, in which he announced that:

"From and after this date promotions to positions of importance in the organization of this Company will be given only to those who are native born or naturalized citizens of the United States, or to those of foreign birth who have relinquished their foreign citizenship, and who have filed with our Government their first papers applying for citizenship, which application for citizenship must be diligently followed to completion.

"Employees of foreign birth who retain their foreign citizenship will not be discriminated against in their present positions or work, but they will not be promoted to positions of responsibility and trust.

"A prerequisite to employment by this company must be loyalty to our Government and our flag, in addition to loyalty to the company itself.

"The factory management is authorized to make this order effective immediately."

This was on January 31, 1916. On March 9, following, Merton A. Sturges, chief naturalization examiner, announced that during February 1,698 foreigners had applied to the local bureau for citizenship papers, setting a record for the number applying in any one month. During the same period, 150 men were granted their final papers. Detroit at that time, he said, led the country in making Americans of foreigners.

On the first anniversary of the publication of the Americans First policy, it was republished and further emphasized, and on January 31, 1919, was broadened by the following addition:

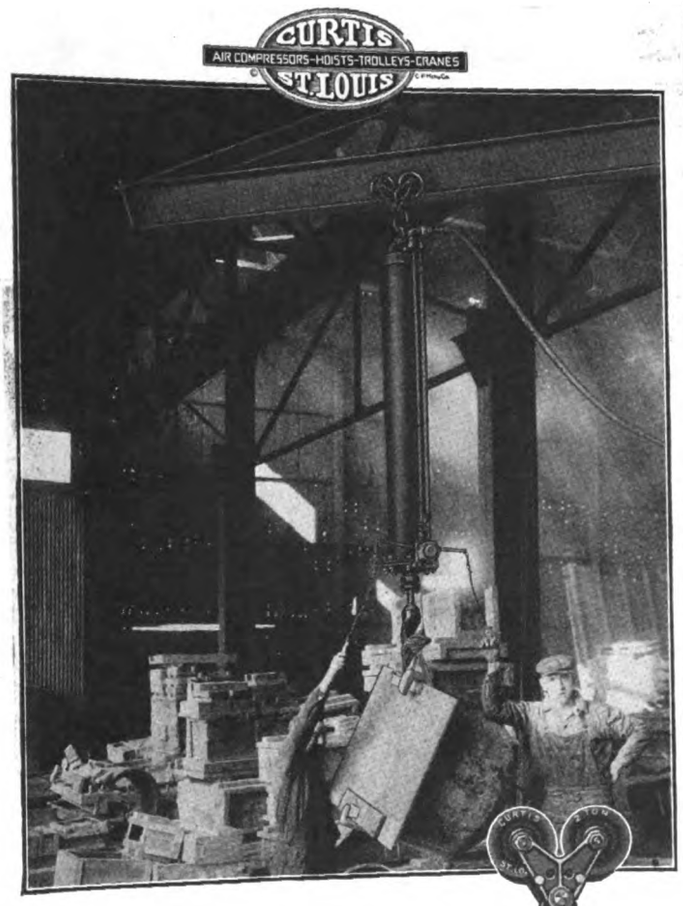
"Every new employee must be a citizen of the United States, or must have filed, or be ready to file, the official Declaration of Intention to become a citizen. To retain his position, he must become naturalized just as soon as he possibly can."

Macauley has done much for the betterment of the automobile industry and has consistently maintained that the manufacturer cannot prosper unless the dealer, too, prospers. While others have pursued a policy of bringing out new models annually and encouraging owners to trade in their old models, Macauley has insisted on perfecting his existing models as far as possible, building cars to last, making few changes, and encouraging owners to wear out their cars, just as they wear out their overcoats. In other words, he is undertaking to solve the "used car problem" by eliminating it entirely, or as far as possible, by discouraging the trading habit.

Modest to the Extreme

It seems paradoxical that one who has forged to the front so rapidly and so irresistibly as has Alvan Macauley should be modest to the verge of bashfulness, but such is the case. Lawyer, inventor, engineer, salesman, organizer, executive that he is, with a record of achievement that has never been marred by a single reversal since he began his steady climb as a struggling young patent attorney at the age of twenty, he yet is so ex-

(*Continued on page 69*)





Air is Power

Use it for Lifting and Moving

Compressed air is usually available in most shops, plants and foundries. Use it—for lifting, moving and transferring heavy machinery, castings, structural shapes, frames, parts and assemblies.

A Curtis All-steel "One Man" Air Hoist is dependable, economical, safe and speedy. Positive in action—close control. Uses excess air power that costs little. Covers a wide area of shop territory by suspending it from a Curtis I-beam Roller Bearing Trolley. Keeps materials moving and increases workmen's productive time. Costs no more than a good chain block.

Furnished in capacities up to 20,000 lbs. and in various types to meet particular needs. Send for complete data.

CURTIS PNEUMATIC MACHINERY CO.
1668 Kienlen Ave. St. Louis, Mo.

CURTIS

71st ANNIVERSARY 1854 1925

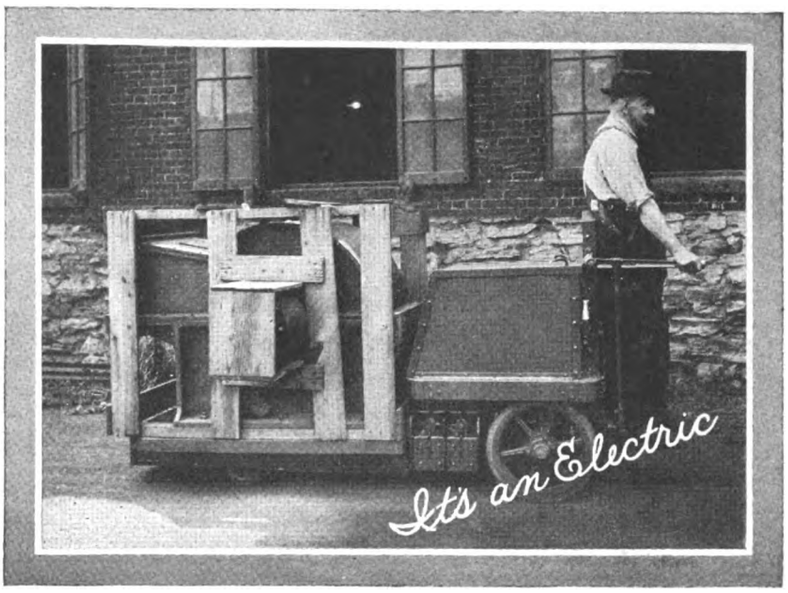
Air Hoists *and* Trolleys

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The Second Step

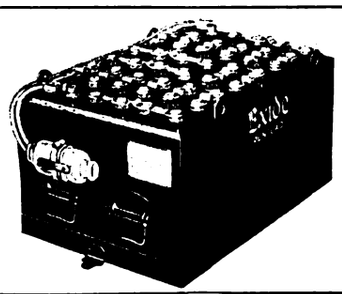
to *really* low handling costs

You first trimmed down the toll of handling materials and work-in-process by putting electric industrial trucks on the job. Now you can lop off more expense by putting a really economical source of power in the trucks.



IN the battery box of the electric industrial truck or tractor lies the opportunity to make a second worth-while cut in handling costs. Plant managers everywhere have tested different types of storage batteries. They have let their cost sheets be the judge. Many of these far-sighted men have standardized on the Exide-Ironclad Battery.

The economy of the Exide-Ironclad Battery can be proved by simple arithmetic, thus: First cost + Cost of repairs and recharging ÷ Number of months in service = Actual battery cost per month.



PLANT managers who handle materials with capable electric trucks and tractors have taken the first step toward rock-bottom handling expense.

Many have gone one step further in their search for cost-cutting handling equipment. They have pounded down expenses still lower by studying the essential qualities of storage batteries.

First cost of the Exide-Ironclad Battery is reasonable. Because of its rugged, rough-and-ready construction it rarely needs repairs or replacements. Its internal resistance is low, its watt hour efficiency is high—hence it wastes very little current—a minimum of kilowatt hours is required to charge it fully—current costs are low. It stays on the job month after month, for years.

And that isn't all

With these convincing low-cost features the Exide-Ironclad Battery combines the essential qualities for effective operation.

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Sustained Speed. It provides all the speed you need—for the first run in the morning, for the *last* run in the afternoon.

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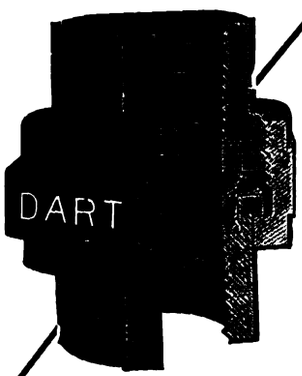
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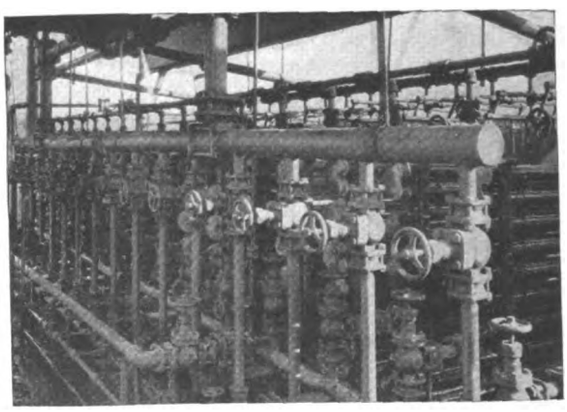
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Peoria, Ill.

NITROSE

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(*Continued from page 66*)

tremely modest that it is almost impossible to get him to talk of his own accomplishments.

Alvan Macauley was born in Wheeling, West Virginia, January 17, 1872, and moved with his parents to Washington, D. C., when he was but a child. There he attended public school, working on a farm during vacation, and establishing a reputation as the champion milker of the community. Thinking he would like engineering, he entered Lehigh University and took a two-year course, only to switch to law at George Washington University. He took his LL. B. from the Columbia Law School in 1892.

His recreation consists chiefly of golf, which he plays "as often as he can find time"—which isn't very often; hunting, and reading. It is said that he reads at least an hour every evening before retiring, no matter what the hour. He prefers history and travel, but has an intimate acquaintance with current fiction as well.

Mr. Macauley was married, November 20, 1895, to Miss Estelle Littlepage and now has two sons and a daughter, all of whom are grown.

In addition to being president and general manager and a member of the board of Packard, Mr. Macauley is a director of the National Automobile Chamber of Commerce, and the National Bank of Commerce of Detroit, and is a member of numerous clubs.

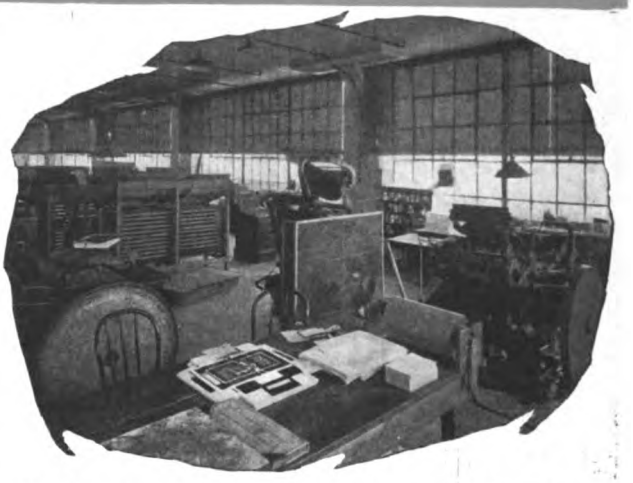
THE current decline in operations at the steel mills follows a period of extraordinarily large production. The daily rate of steel ingot output in March was slightly larger than in February and practically identical with the maximum rate, reported a year earlier. New orders declined in March and a further slackening in operations is thereby indicated.

The inventory situation in general is more favorable than it was a year ago. Hand-to-mouth buying has come to be accepted as a relatively permanent feature of merchandising, and seems to represent on the whole a stabilizing influence.

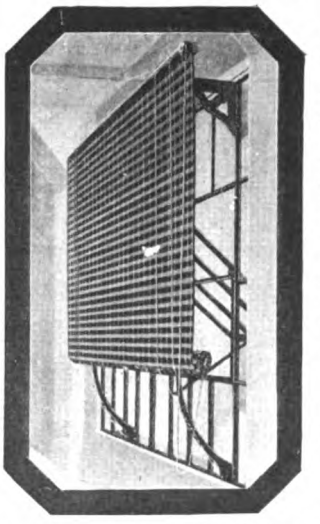
There is evidence of increasing reliance upon systematic coöperation in industry for the lessening of avoidable waste in various forms. Every step in this direction provides an enduring safeguard against misfortune when general conditions are unfavorable and a strengthening of the bases of profit-making at all times.

And in the conduct of the public business also unremitting watchfulness is necessary. Business men rightly desire every encouragement for proper governmental economy, with taxes made as low as the maximum efficiency of the public service permits. The reduction of federal taxes begun last year should be continued by such a revision as would not only further lighten the aggregate burden of these taxes but distribute them more equitably. The urgency of the situation would probably warrant the calling of Congress in special session, expressly for action in this matter. State and local taxes also are in many cases unduly high, and there is room for helpful coördination of these taxes by removing unnecessary and irritating duplications. A wise fiscal policy, however, will include provision for continuing the gradual retirement of the huge national debt incurred during the war.

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Sectional view Fig. 370, Standard Bronze Gate Valve.



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The construction of a Jenkins Gate Valve gives assurance of trouble-free service.

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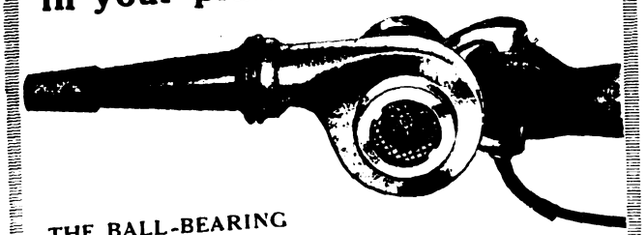
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Air: Our Most Important Fuel

(*Continued from page* 24)

that the combustion chamber, between the grates and the lowest boiler tubes, is large enough to permit at least 95% of the actual burning of the gases yielded up by the fuel to take place *before* the sweep of the draft pulls these gases up through the closely nested bank of water tubes. Direct flame should not impinge on these tubes, or they will quickly be burned out. It is the sole function of these tubes to absorb heat from the gases of combustion, and to do this efficiently two baffle walls are placed in such a manner as to direct the flow of these gases through the bank of tubes three distinct times. As a consequence of this baffling, the temperature of the gases on reaching the chimney should not be appreciably over 500° F., or somewhat less than the ignition temperature of the fuel. Higher temperatures usually



Fig. 16. Building furnace wall with care. It pays to employ skilled masons to lay up furnace brickwork, because the life of the walls depends largely on the care with which the joints are made.

indicate a waste of heat up the chimney due to an excess of air in the furnace.

In the second illustration a similar water tube type of boiler is shown, but with the fuel fired by means of a traveling grate stoker, with forced draft. The combination of stoker and draft makes possible a very much higher rate of combustion, and necessitates a greatly enlarged combustion chamber. The faster the rate of burning the more air is needed to support the combustion. Notice here the effect of an ignition arch—designed to attain a heat greater than that of the burning gases, and consequently to serve as a means of igniting them more completely.

The function of an ignition arch may be better understood when it is realized just what happens when fuel is burned. Fresh coal spread on a fire is first "roasted" by the heat in the furnace, and the moisture driven out in the form of water vapor. This water vapor tends to cool the furnace. Next the volatile hydrocarbons in the fuel (ethylene gas, methane gas, tar, pitch and naphtha, to name but a few of the most important) are distilled out, almost all together, in a thick heavy haze. At this point, if there is not some part of the furnace above the fuel bed hot enough to ignite these gases, plus an excess of air to furnish the required oxygen, they will all pass off up the chimney, and on striking the cool air outside, will be condensed into sooty smoke. By reason of its

(*Continued on page* 74)

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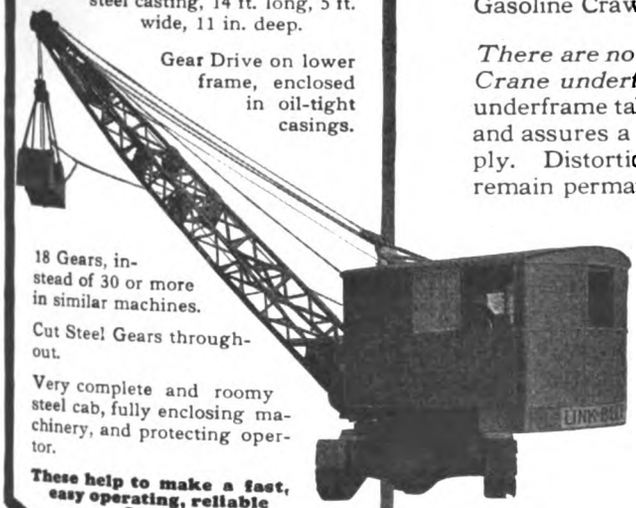
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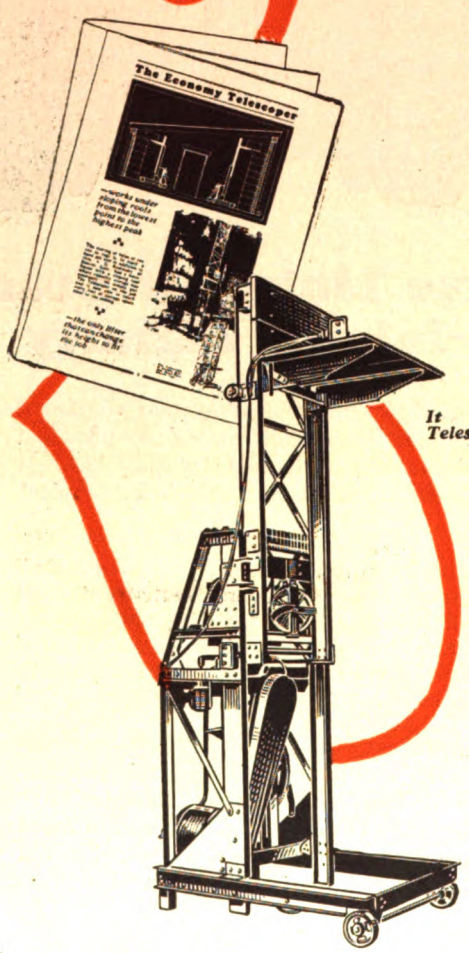
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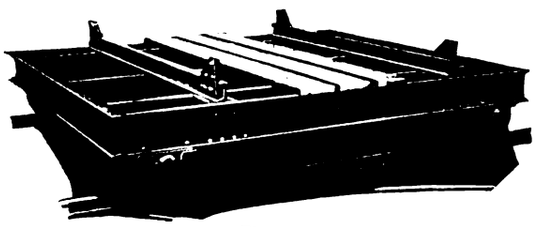


Fig. 4890

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(*Continued from page 70*)

construction of refractory, or non-heat-conducting materials, the ignition arch becomes very hot, and by reason of its position, deflects and mixes these gases with air, at the same time raising their temperature to the ignition point, so that they burst into flame, and are consumed, or oxidized.

The importance of maintaining an ignition arch in the correct position for high volatile coals may be seen by noting the temperatures required to kindle the gases of combustion. Coal may be ignited at comparatively low temperatures compared to these gases. The following ignition temperatures are quoted from the Babcock & Wilcox treatise on "Steam":

Bituminous coal	700° F.
Semi-bituminous coal	870° F.
Anthracite coal	925° F.
Hydrogen (H)	1130° F.
Carbon monoxide (CO_2)	1210° F.

The hydrocarbons distilled out from the fresh fuel burn by uniting chemically with oxygen, in common with all combustible substances. Two hydrogen atoms unite with one oxygen atom to form water vapor (H_2O), yielding up heat as they do so. The carbon atom unites with two oxygen atoms to form carbon dioxide (CO_2), yielding up heat. Both H_2O and CO_2 are products of complete combustion.

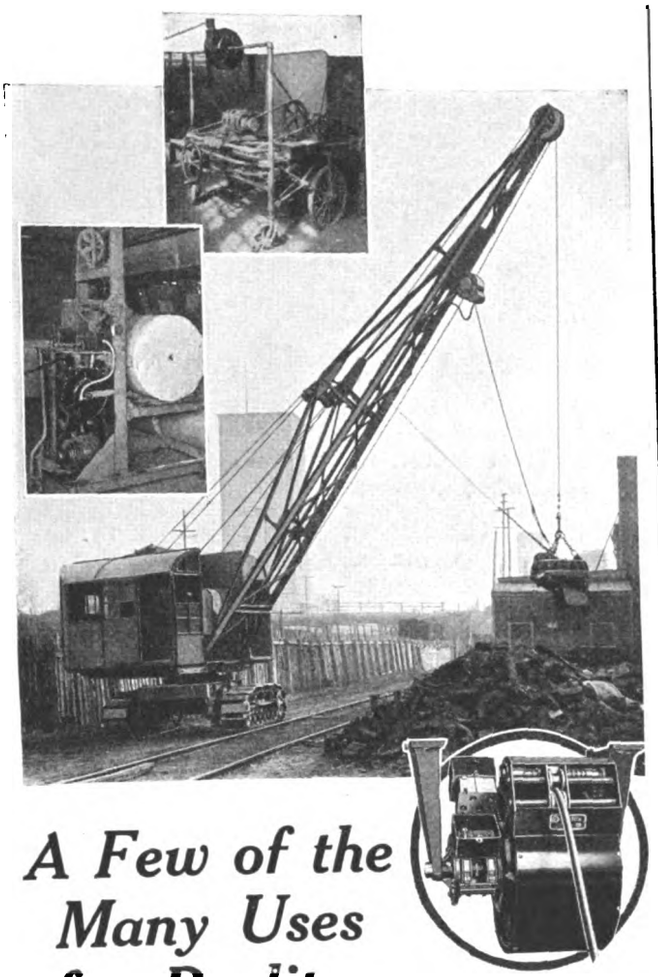
But if insufficient oxygen is present, only a part of the hydrogen oxidizes, and a single atom of carbon unites with a single atom of oxygen to form carbon monoxide (CO). This last item indicates the major heat loss, for the difference in the heat value of CO and CO_2 is this: One pound of carbon burned to CO_2 yields about 14,540 B. t. u., while a pound of carbon burned to CO only yields 4,380 B. t. u. This same CO, however, if brought up to its kindling point (1210° F.) in the presence of enough air to permit an extra atom of oxygen to unite with each molecule of carbon monoxide, will burn to CO_2, and in doing so yield up exactly the difference in heat value between the two gases (10,160 B. t. u.).

The third illustration shows a vertical water tube boiler stoker-fired, and with forced draft. Here again ignition arches and large combustion chamber volume play a large part in burning the fuel thoroughly before the gases flow through the boiler passes.

The essential facts of combustion apply equally, of course, to fire-tube boilers, whether internally fired or return-tubular. The combustion chamber must be large enough to provide for a sufficient volume of air mixing with the gases of combustion, to reduce the carbon and hydrogen of the fuel to CO_2 and H_2O. And the furnace must be so designed that these gases of combustion may be raised above their ignition points and mixed with oxygen, so that they will burn as completely as possible before they reach the chimney.

For, regardless of the type of boiler used, the guiding principle in furnace design must be that, like a carburetor, it will mix air and fuel in the correct proportions for complete combustion. And, since these proportions vary according to the type and grade of fuel used, the method of firing, the draft available and the load factor of operation, it is plainly seen that no one design of furnace may be universally used. You must design, or adapt

(*Continued on page 76*)



A Few of the Many Uses for Reelites

THE Mogul Type Reelite finds a profitable use wherever power is to be carried to portable equipment—on all kinds of mobile machines, cranes, dredges, electric magnets, railroad and mining machinery, etc. The cord is kept coiled in a container, clean and unkinked, and is automatically unreeled and retrieved as the location of the equipment demands. This saves considerable time and trouble, and frees the cord from wear, which in turn keeps the machine in service—adding profits instead of losses.

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Our engineers will gladly explain how it saves in operating costs, convenience, safety, and how it can be adapted to your requirements. Ask them.

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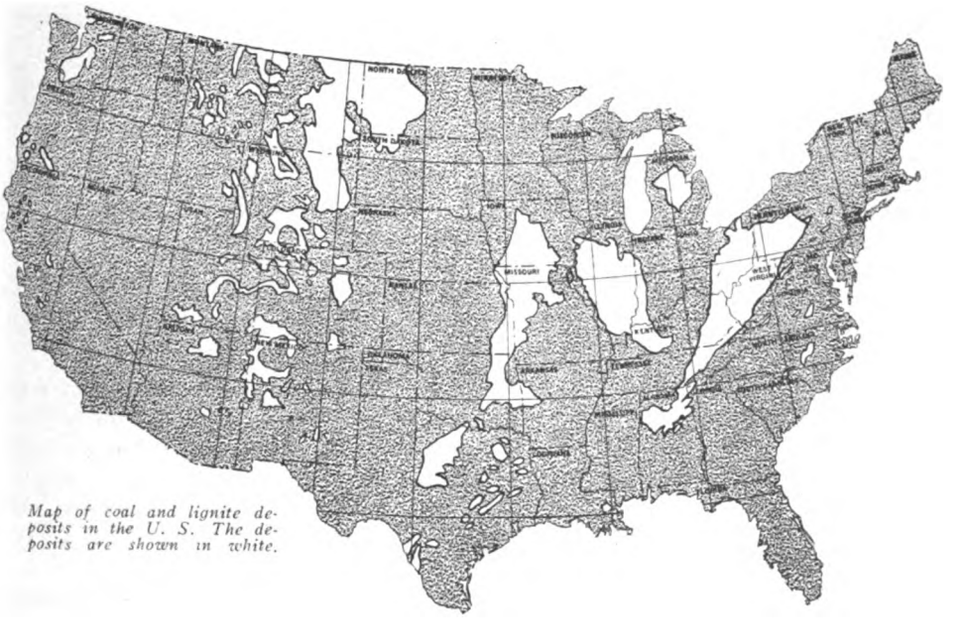
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Map of coal and lignite deposits in the U. S. The deposits are shown in white.

Burn your cheapest local coal...

A GREAT many manufacturers, located right in the heart of coal producing districts, are paying a high price and heavy freight rate for coal shipped from distant mines.

The owners of these plants would say that it is necessary to pay this higher price to secure coal of satisfactory quality. Yet in the same locality there are probably a number of plants, with equal or greater power demands, that are meeting their steam demands with the inexpensive local coal.

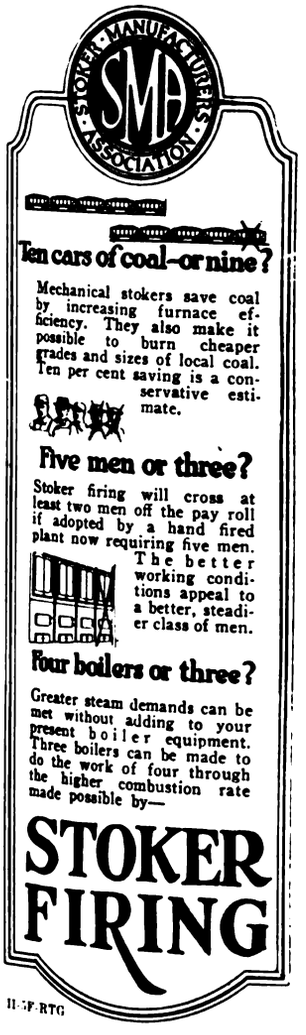
The explanation is simple. The factor that usually decides the value of coal for producing steam is not its quality, but the *way* it is burned.

The difference between the plant that can burn local coal and the plant that pays the higher price, is the difference between scientific combustion and hit-or-miss firing methods—the difference between the plant equipped with mechanical stokers and the plant that is hand fired.

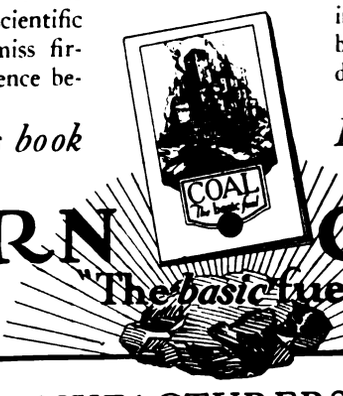
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In doing this he draws upon a vast fund of data secured in solving hundreds of similar problems. Therefore the recommendation he makes of a certain type of furnace and mechanical stoker installation is based on its known ability to burn the cheapest local steam coal at highest efficiency, and to effect also a predetermined saving in labor costs.

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119 Summer Street Dept. II Boston, Mass.



(*Continued from page 74*)

your furnace to your own particular conditions of service.

Yet, having done this to the queen's taste, and made certain to your own satisfaction that your furnace is theoretically as near right as it is possible to get it, you may still be wasting fuel because you have not guarded against an excess of air. Says Joseph Hays in "How to Build Up Furnace Efficiency":

> "That furnace is the most efficient which completely consumes the combustible with the least surplus of air."

Reducing that cryptic yet masterly sentence to its simplest terms, what he means is this: Too little air in the furnace may result in heavy smoke and waste of unburned fuel up the chimney, but too much air means a cool furnace and a hot chimney. When cold air leaks in through the boiler setting, it very naturally cools off the gases in the combustion chamber and prevents their complete oxidation there by lowering the temperature below the kindling points. But as the gases flow through the boiler passes they absorb the heat already there, and, uncombined oxygen being present in volume, by the time they reach the chimney they are burning merrily, yielding up their heat to warm the chimney *after* they have passed the boiler.

Brickwork is like a sponge. With a condition of partial vacuum inside the furnace produced by the draft, and the presence of atmospheric pressure outside the furnace, air will pass through brickwork like water through a sieve. This condition is, of course, greatly aggravated in settings which have been subjected to the play of varying temperatures for long periods. Here you will find minute cracks and fissures all over the setting which may easily be the equivalent, summed up, of an opening directly into the combustion chamber a foot or more in diameter.

It is a simple matter to find out if this is so or not. Take an ordinary tallow candle and light it. Then, while the furnace is in operation, pass the flame of the candle closely over the outer surface of the brickwork, and notice the points where the flame is sucked in. There are the danger points! A plastic coating over the entire outside of the furnace and boiler setting will cure this condition effectively. But don't be content merely with stopping the leaks—keep them stopped by constant vigilance in testing for and plugging up the holes.

Closely allied to the necessity of keeping the exterior surface of the setting air-tight is the equally important need of keeping the interior surface of the furnace gas-tight. The consuming effect of high furnace temperatures on brickwork is well illustrated in the accompanying views. Under certain conditions, the exposed surfaces of the walls will actually melt and run down to the grates like warm butter. And the flames will burn large holes in the ignition arches wherever the cement between the joints may be in the least degree weak. For this condition again the popular remedy is a plastic coating, but this time of high refractory material which will withstand the scouring effect of the flames. Such a coating helps not only to cut down the admission of excess air, but assists in reducing another item of loss: radiation of heat from the furnace. But its chief function is to give longer life to the furnace linings, and its intelligent

(*Continued on page 78*)

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TWO THOUSAND MICHIGAN INDUSTRIES Protect their Employees Against Infection By Using

In 1923 there were 84,747 wounds reported to the compensation board of Pennsylvania. Five per cent of these (4,212) were infected. The average time lost in non-infected cases was fourteen days. In infected cases it was forty-six days. The loss in dollars, days and lives totalled $354,000; 185,000 days' work and thirty-eight lives, in addition to unmeasurable suffering, anxiety and crippling — largely preventable and unnecessary.



CRESOG is recommended for minor injuries in the absence of a physician and eliminates the possibilities of infection.

CRESOG does not burn or destroy tissue, or discolor the skin like Iodine, and the dressings stay moist 12 to 24 hours.

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CRESOG is furnished in 4-ounce and Gallon sizes. Place your First Aid Department on a business basis. Instruct your Purchasing Agent to order a trial size today.

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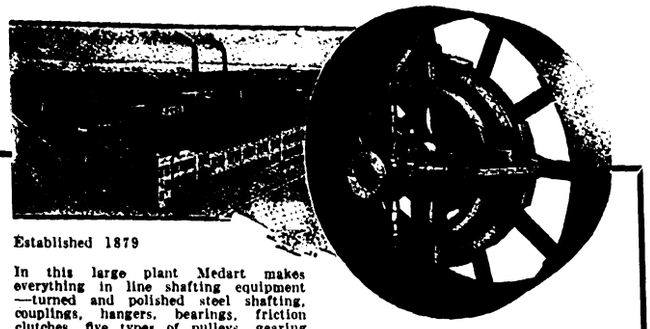
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Enclosed find $1.00 for 4-oz. trial size of CRESOG. If not satisfactory after 60 days use you agree to refund our money.

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The Clutch That Clutches!

Because it possesses (1) large starting capacity and (2) great mechanical stability, Medart V-Groove Friction Clutches are ideal for general transmission work. By their use, judiciously placed, line shafting equipment can be so divided into units that easy and quick control of the various departments is accomplished with resultant money-saving, convenience and safety benefits.

Medart Clutches possess these fundamental advantages—simplicity of construction, ease of adjustment and positive action. No springs, cams or intricate apparatus are employed. Supplied either solid or split construction, as desired, the Medart can be used either as a clutch cut-off coupling or as a clutch integral with a pulley, gear, sheave or sprocket—so that either a department, a line shaft, a countershaft, or a machine may be placed under separate control. The thousands of Medart Clutches in use give testimony to their splendid utility and satisfactoriness. Ask for Booklet "The Clutch That Clutches," and specify Medart on your next Friction Clutch order.

MEDART

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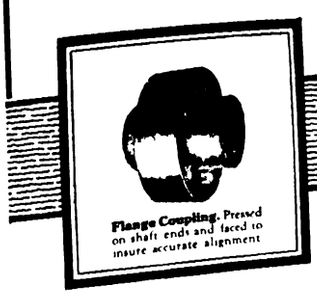
Besides clutches, Medart makes a complete line of Power Transmission Equipment. Concentrate your purchases and fill all your transmission requirements, through Medart Catalog 43, with discount sheet. This affords a simple, direct method of economical buying. Engineers' estimates furnished on your specifications without obligation.

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(Formerly Medart Patent Pulley Co.)

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Flange Coupling. Pressed on shaft ends and faced to insure accurate alignment



Drop Hanger. Double brace, four-way adjustment, with either ring oiling, wick or plain oiling bearings

(Continued from page 76)

use for this purpose will materially reduce the cost of furnace maintenance.

The moral of this tale is plain: Watch the air; burn it as conscientiously as you burn the fuel you pay for.

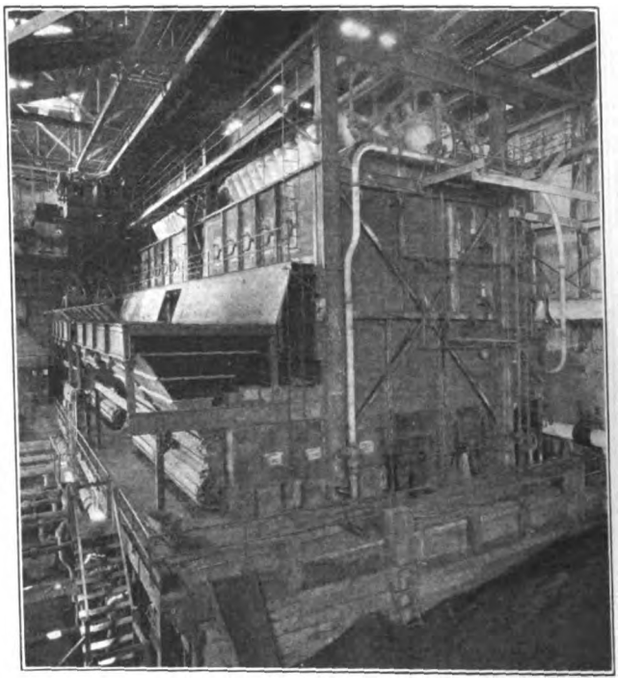


Fig. 17. A battery of modern titanic boilers. View taken at the downtown power house of New York Steam Company during construction of a new addition to the plant. This gives a good impression of the size of the equipment required in commercial plants.

Treat air as your most important fuel, and the care you expend on burning it wisely will fatten your pocketbook an hundred-fold.

THE automobile industry is now entering upon a period of increased activity. The output in March probably exceeded 300,000 as compared with 287,000 in February, 241,000 in January and 209,000 in December, when the automobile factories were working at only 50 per cent. of capacity. Manufacturers will have to turn out an average of 310,000 a month during the remainder of this year if the 1925 output is going to equal that of 1924, when 3,638,000 cars were produced.

It seems fair to assume that at least as many automobiles can be sold this year as last and the industry will thus enjoy a substantial volume of business. Although last year's sales did not come up to the expectations of many manufacturers and the enforced curtailment of output during the last six months left a bitter aftertaste in regard to the 1924 business, the year as a whole cannot be considered an especially poor one since a decidedly larger number of cars were manufactured than in any previous year with the exception of 1923.

As a result of the heavy rate of production in recent years, there are now so many automobiles in the United States that expansion in the future is going to be less marked. During the past thirty years only about 7 million cars have been scrapped and a million exported so that out of the total of 24 million cars made about 16 million were in running order in the United States at the beginning of 1925. That is equivalent to one car for every seven people.—*Alexander Hamilton Institute.*

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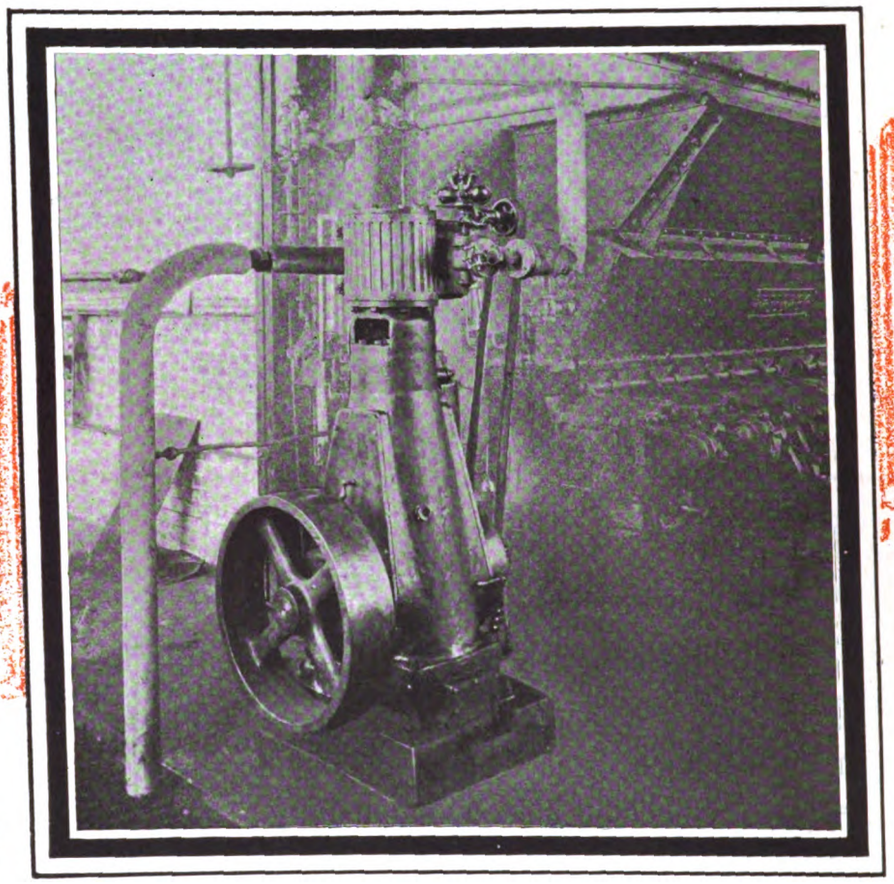
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A Troy Engine driving stokers in the plant of the Columbia Light & Water Works, Wilson, N. C.

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Industry is guarding and watching its power costs as never before. It is awake to the wonderful opportunities for profit making possibilities through more economical power plant operation.

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What British Industries Are Doing for the Workers

(*Continued from page* 15)

the individual. In place of stifling individuality, the effort has been directed toward giving greater scope for it.

It is customary to group these activities under the general term of Welfare, but study of the situation confirms the opinion that this is not a sufficiently comprehensive term. For the moment, it seems more pertinent to classify them into Welfare, Recreation, Education, and Managerial.

Welfare, properly speaking, relates to those measures for improving the conditions of work and for providing means for ensuring security for the future. Working conditions, health, benefits respecting illness and unemployment, and old-age pensions.

Medical examination has long been a preliminary to employment in British industries, and examination following serious illness has been found an essential safeguard to the welfare of the large numbers grouped together in the modern factory. Many British factories maintain their own medical staff and more recently dental clinics have been added to augment the safeguarding of the physical condition of the employees.

Swimming baths, washrooms, drinking fountains, and other equipment for improving the cleanliness and sanitation throughout the factory are comparatively common in Britain today. Safety First campaigns have exerted substantial influence in reducing the number of accidents. Carelessness on the part of the individual is a more important factor than generally credited in industrial accidents.

Much legislation is in effect relating to the working conditions in various types of factories, but the more progressive firms have anticipated the Acts of Parliament. In some respects, certain of the laws were patterned after what was already established in certain factories. In fact, it is not unlikely that the more notable installations relating to the human side of industry preceded any such installations throughout the industrial world.

Insurance against illness and unemployment are now compulsory by legislation, but certain firms provide a supplementary benefit through a local pension scheme. In a similar manner, security for the future is provided in savings funds or old-age pensions. By these means, the fears of unemployment and of penury in later years are overcome.

The details of the pension schemes vary with the individual firms but there is a growing tendency for all to follow the same general lines. In one or two of the leading schemes the contributions range from 2.5% to 5.5% of the members' wages according to the age at joining. The firm contributes a similar amount.

In some of the pension plans the retiring age is 65, but there is a distinct trend toward the lowering of the age of retirement. The earlier age of 60 has been adopted in several schemes for men and 55 as the retiring age for women. It seems probable that these latter limits will become universal in the not far distant future.

The annual payments for pensions in one prominent scheme are calculated at a fixed percentage of the aggre-

(*Continued on page* 83)



Why is the Trend So Decisively Towards Speed Reducers?

There are many answers. They vary with individual operating conditions. They are all contributory to the one broad, general answer.

Enclosed speed reducers transmit more power at less cost.

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You will find interesting, instructive and helpful reading in this broad interpretation of an important new development in plant operation and maintenance.

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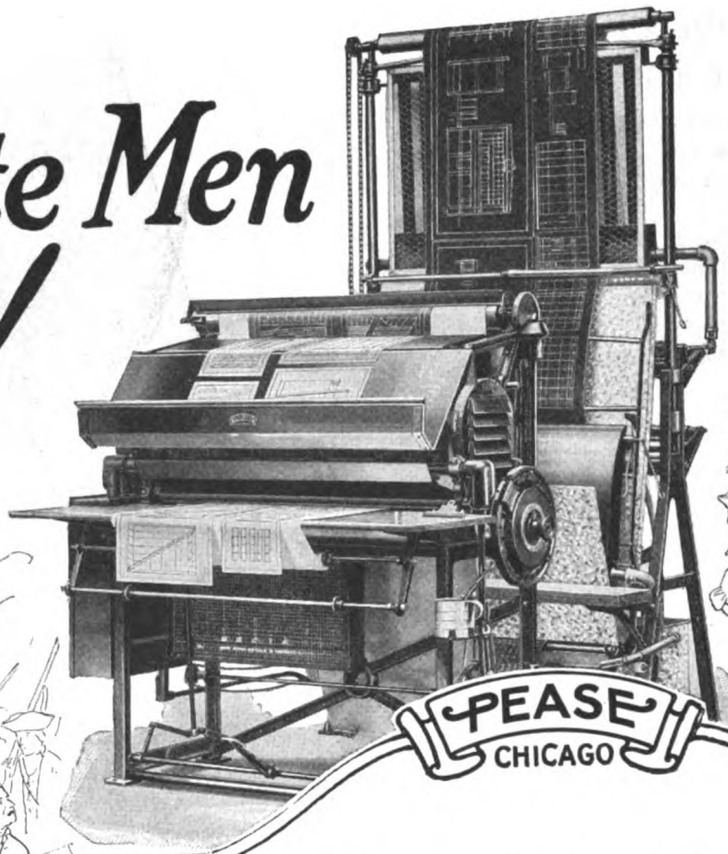
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(*Continued from page* 81)

gate wages paid and this percentage is re-considered at the end of each five years. The administration of the fund is a joint matter, the workpeople and staff being represented by members elected for the position at stated intervals.

Recreational activities, particularly as regards sports, are common throughout Britain. Playing fields for cricket, tennis, hockey, football, and similar sports are provided. In certain cases, a nine hole golf course is available and putting greens are not unusual. The area and nature of the recreation grounds vary, but as a rule are ample for all needs. At the Bournville works of Cadbury Brothers, for example, there are 110 acres in recreation grounds while the factory covers less than 35 acres.

Under recreation should be grouped the social activities. Dramatic clubs, musical societies, camera, wireless, literary, dancing, bridge, any and every form of social activities are in evidence. As one Managing Director stated, "We believe every individual is better by having a hobby of some kind and we propose to offer every facility for developing it." While the firms provide facilities for meetings, the clubs in each case are self-supporting and managed independently.

Management of the sports is a joint matter, the firm in all cases being represented by some one of the Directors, but the actual supervision is usually left to elected representatives of the individual members. An annual membership fee of a few shillings is usually charged, for which the member is entitled to participate in or attend any of the games and fixtures throughout the year. Every encouragement is given to the individual to follow their particular desires, but membership or participation is not insisted upon.

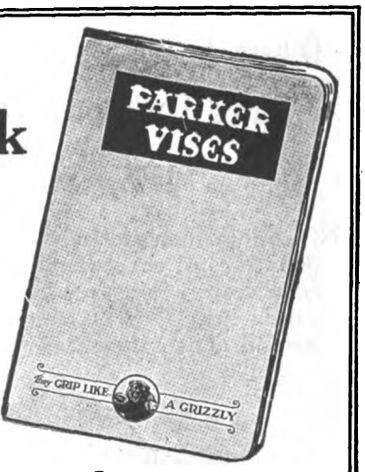
The drama and music are specially encouraged, and many firms provide a concert hall with a well equipped stage for such performances. Usually the hall serves as a dining room for the works canteen. A pipe organ has been part of the dining hall equipment at Bournville for nearly 25 years.

To witness a production of Shakespeare, a modern drama, or a Gilbert and Sullivan opera, where the entire cast, orchestra, conductor, and producer are composed of workpeople from the factory, is necessary to appreciate the full scope and significance of this phase of industrial life. Workpeople are interested in other things besides wages, and the collection of large numbers in modern factory organizations makes possible the provision of facilities for giving full vent of the particular talent of the individual.

Educational developments in various British industries provide ample food for thought on the part of anyone, whether or not directly interested in industrial matters. There are three distinct phases—Vocational, Continuation, and Adult, the two latter showing particularly that certain of Britain's industrial executives have acknowledged a responsibility which must in due course become general throughout the industrial world.

In the past, industrial education had for its object the improvement of the worker as a producer—apprentice instruction. Such vocational education is in evidence throughout Britain and presents many interesting features. Whether actually working as apprentices or not, it is essential that each individual understands the nature

This Book Tells the Story



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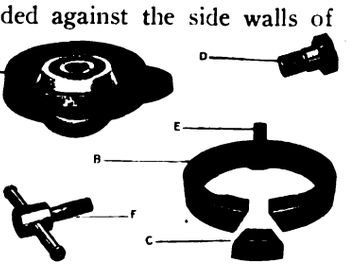
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of the work and all matters incidental to it if they are expected to give good performance.

But boys and girls enter factories at the age of 14, and it would be idle to assume that their general education is complete. For that reason, the Continuation School plan has been developed in certain factories, whereby each boy and girl attends school for general education for two half days each week until they attain the age of 18. This attendance is compulsory, as they draw pay from the firm, but the school is under the direction of the local educational authorities. As an incentive to study, most firms provide for wage increases to be partly influenced by the school record.

In this matter, those executives who formulated this continuation education plan have shown that they are capable of taking an exceedingly long and wide view. Ten years' experience has proved that seven and one-half hours weekly devoted to education in its widest sense, if wisely employed, can be of inestimable value during the impressionable period of adolescence. A more highly developed intelligence for dealing with the ordinary business affairs of life is thus provided in addition to securing a factory staff of higher mental calibre and with an increased sense of responsibility.

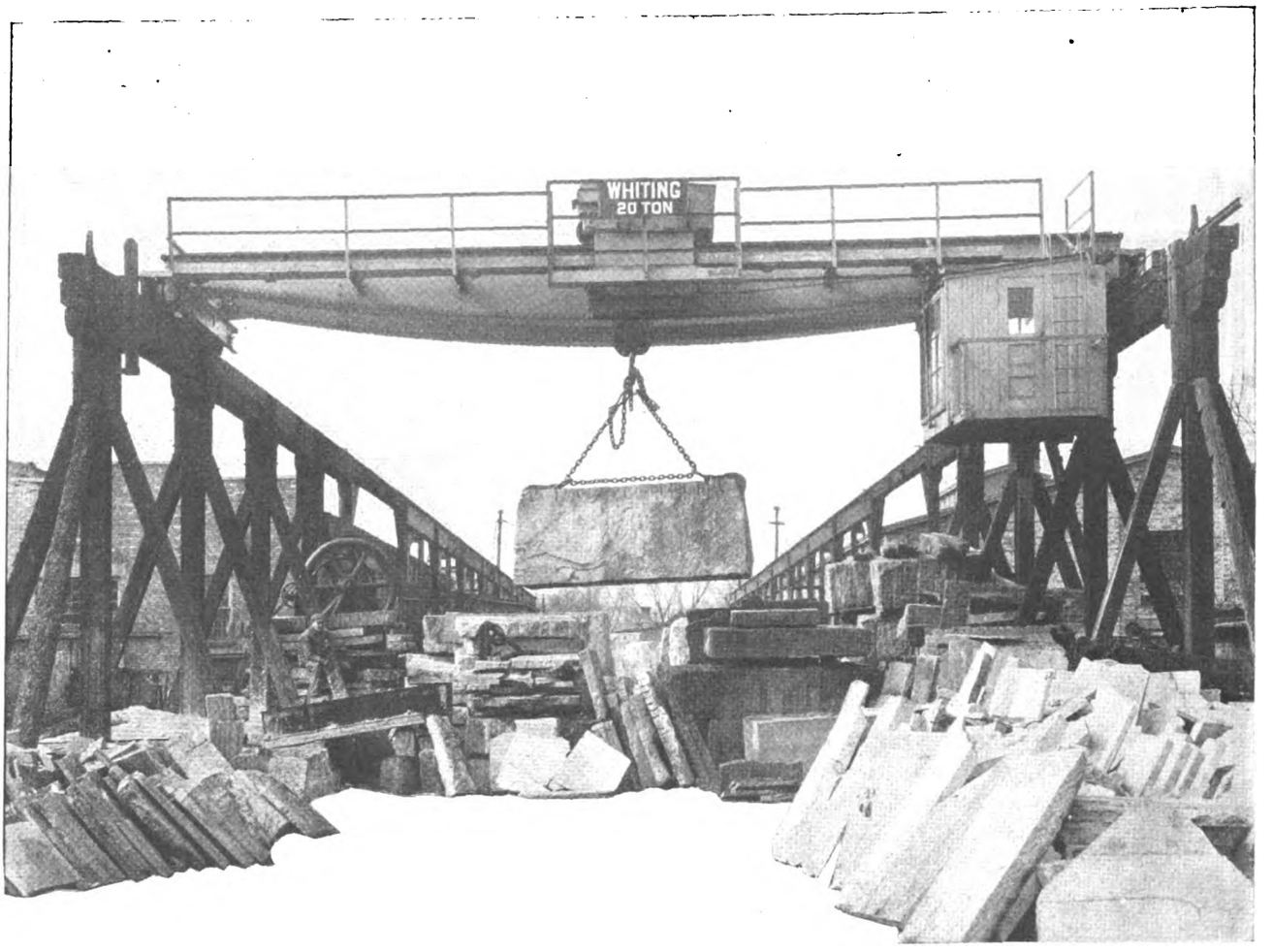
Physical training is also an important feature. In certain factories, each boy and girl receives one lesson each week up to the age of 18. Between 14 and 16, they have also one swimming lesson each week. Such instruction under the direction of professional experts effects substantial improvement in the physique and general health of the workpeople.

But it would be a mistake to assume that education is completed when the age of 18 is reached, or that the individual who desires to continue his or her education can do so effectively without assistance. Combining adult education with industry is indicative of the vision of certain of the British executives.

It takes the form of evening classes, of providing scholarships in univerisities, of a course of lectures on current topics, of week-end schools, in fact, of organizing plans whereby the self-development of the individual can be effected to the best advantage. Classes to train girls for the duties of motherhood, classes in cooking and household work, classes in gardening and similar subjects. Thus are boys and girls educated to be useful members of the community in addition to learning about their daily work in the factory.

The education of an adult must be largely regulated by the volition of the individual. After the age of 18, the employer can only provide means for encouraging the individual to improve his or her knowledge according to inclination. This can not only boys and girls, but men and women, increase their usefulness to the community and indirectly become more valuable to the industrial organization.

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Three-motor Whiting electric traveling crane in the stone yard of Adam Groth & Co., Joliet, Ill. Capacity, 20 tons, span, 48 ft. 4 in. Whiting electric cranes are made in all capacities up to 250 tons. We are equipped to design and build cranes of any type, for any service.

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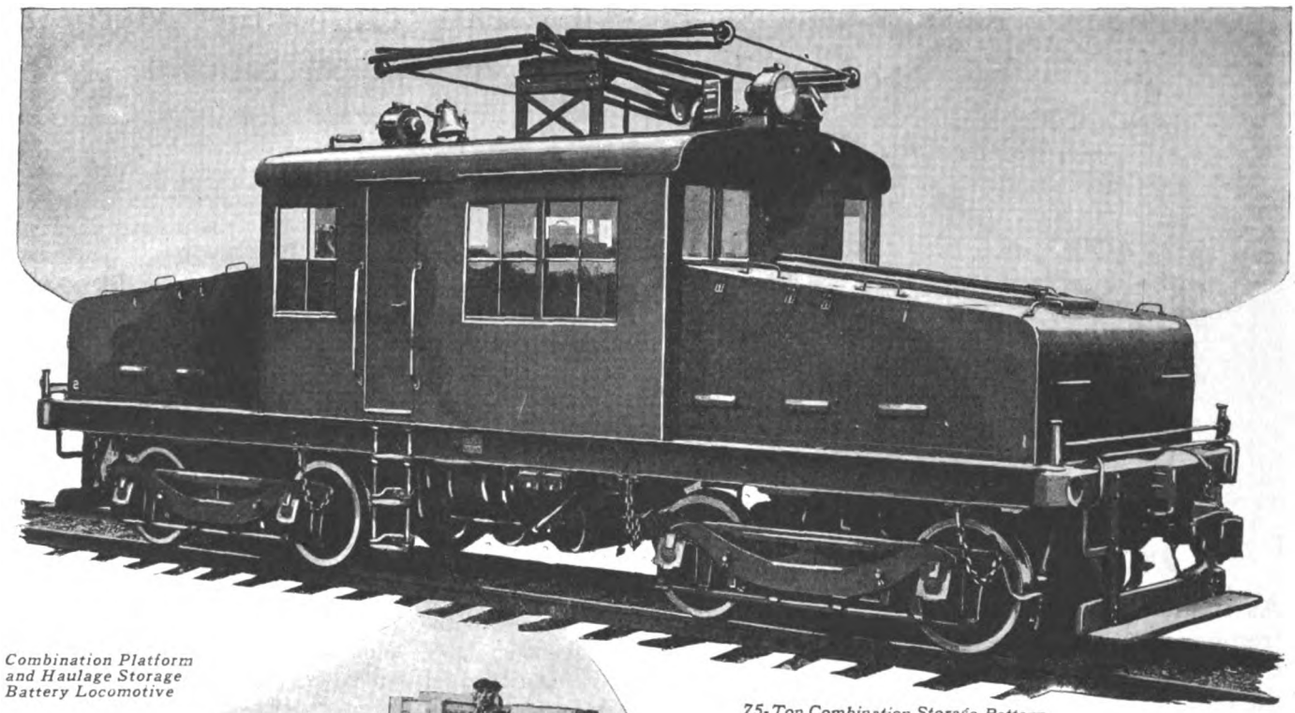
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Responsibility for their manufacture is undivided. Every step from the cutting of the frame plates to the track-test run is under General Electric control.

The haulage problems in General Electric's various plants have been great. But these are only a few of the many that G-E engineers have solved in the last 30 years.

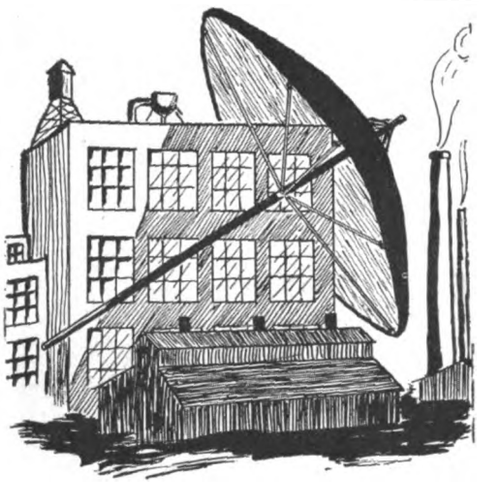
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GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN ALL LARGE CITIES

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Like a Sunshade Over Your Plant

As manufacturers know, production increases tremendously on days when there is a haze in the atmosphere, lessening the intense glare of the sun.

BLU-EE, on the window glass, makes this condition constant, prevents eye-strain, allowing no glare, shadows, nor sweltering heat to penetrate into the factory. It acts as a huge sunshade over your plant.

No matter how dazzlingly the sun shines outside, BLU-EE filters out the blinding heat rays and allows only the light rays to enter.



It is more effective than awnings or shades and costs only a fraction as much. Will not rub off, but can be easily removed with warm water.

OUR OFFER

We will send you a box containing two packages of BLU-EE,—enough to cover 2,000 square feet. Use one of the packages as a trial. If you are not satisfied with the result, return the other at our expense and forget the matter. If it is satisfactory, mail us your check for $5.00 (Discounts for quantity orders). Fair enough, isn't it?

PARK CHEMICAL COMPANY

3820 Edwards Road

Cincinnati Ohio

Please send me 2 packages of Blu-EE, sufficient to cover 2,000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with Blu-EE, and if not entirely satisfied may return the other within thirty days and you will cancel this order.

Firm Name..... Position .....

Your Name..... Address.....

American Handling Methods in Far-off Siberia

(*Continued from page 21*)

trying circumstances.

Due to labor troubles existing between the unions and the railway, the prices which are used in the following comparison of costs were given by the railway management to the laborers after a compromise agreement. These prices permitted the railways to operate the conveyors without encountering contemplated trouble which the union heads assured them would take place. These costs will prevail until the government, and the railway, can control their own property, for the benefit of the port. At that time a lower wage cost will be agreed upon. It will readily be seen that the conveyors are not starting out to operate at a so-called lower handling charge, although some advantages are gained.

The following comparison between handling by manual labor and by conveyors is very interesting. In using the figures the reader should consider especially the quantity, instead of the cost in kopecks; it, of course, being understood that the money cost is high because of the aforementioned labor trouble:

COST OF CONVEYING BEAN CAKES AND BAGS TO SLINGS AND FROM GODOWNS. MANUAL LABOR, COST PER TON.

Godown No. 1 to Sling.	57 Kopecks
Godown No. 2 to Sling.	114 Kopecks
Godown No. 3 to Cars.	57 Kopecks
Cars to Sling.	57 Kopeks plus switching cost.
Cars to Godowns.	57 Kopecks

QUANTITY HANDLED PER 8-HOUR DAY. CAKES OR BAGS.

One Ton, per man, per hour.

Eight Tons per man per day.
Average 18 Slings per hour.
Average 19 Bags per sling, approx. 54 cakes.
Average 20 men per sling.
Each conveyor line will be able to accommodate 2 slings.

CONVEYOR COST OF HANDLING, PER TON (Estimated)

Godown No. 1 to Conveyor.	42 Kopecks
Godown No. 2 to Conveyor.	47 Kopecks
Godown No. 3 to Conveyor.	51 Kopecks
Cars to Conveyors to Godowns.	31 Kopecks

QUANTITY HANDLED PER HOUR BY CONVEYORS (Test Runs)

Beans in Bags,	10 to 15 bags per minute. ***60 to 90 tons per hour.***
Bean Cakes,	20 to 34 cakes per minute. ***42 to 71 tons per hour.***

Before starting to operate the conveyor, a flat rate of 14 kopecks per ton was offered to the men used in operating the conveyor, but this was turned down flat, and it looked as if the conveyors would not be used, although they were installed. Later, the union and railway managed to come to a settlement and the quoted prices were decided upon. It is true they are too high, particularly when we consider the increased amount that can be handled. The men are now able to double their present wages and still get by with less effort and hard work.

The number of men that will be used to operate the conveyors (for each line, of which there are six) is as follows:

5 men for loading conveyors in godowns,
5 men for receiving per sling,
2 men as inspectors along the line of conveyor,
Total per sling, approximately 12 men,
Total per conveyor, when two slings are used, 17 men.

(*Continued on page 90*)

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An Advertisement for the Manufacturing Division of the Smith Gas Engineering Co.

Gas heat is cheaper
—here are actual cost figures

MORE finished work with the same equipment and labor, faster production, greatly decreased spoilage, and enormous fuel economies—producer-gas is bringing these benefits to others daily. Read these figures—then compare them with your own.

Day in and day out since 1917 a Smith Clean Cold Producer Gas Plant has been operating at an Ohio plant.* The outfit consists of three hand-operated producers each with a daily bituminous coal capacity of about twenty tons.

Gas costs this firm 7.3c. per 1000 cu. ft. Adding a $2000.00 per month fixed charge, the gas cost becomes 8.2c. per 1000 cu. ft.

This is the equivalent of city gas at 30c. per 1000 cu. ft. or to natural gas at 52c. per 1000 cu. ft.

If the latest type mechanical producers were used here, labor reductions would bring their gas costs to the equivalent of city gas at 26½c. per 100 cu. ft. or natural gas at 47½c. per 1000 cu. ft.

Comparing these costs with average city gas at 60c. per 1000 cu. ft. in large quantities, this plant installed in competition with that city gas would pay back, in savings, the entire investment including buildings and foundations in less than ten months.

Opposite are this firm's* actual cost records:

Because of the rapidly increasing interest shown by manufacturers in producer-gas, the Smith Gas Engineering Company has inaugurated a Consulting Service for advising on the proper applications of gas and detailing the exact costs anticipated under all conditions. This service is not intended to influence the sale of equipment—it is not primarily a part of the Smith selling organization. So a slight charge is made for it.

Take advantage of the twenty years' experience of the engineers on the staff of this Consulting Service—they have saved money for others and can cut your production costs too.

*Name will be furnished on request.

January, 1925

Metered gas output	218,678,000 cu. ft.
Water for gas cooling.. (3½ lbs. per lb. of coal)	7,399,260 gals.
Steam for driving exhausters, etc. ..... (less than 1 lb. per lb. of coal)	3,498,848 lbs.
Month's average B.T.U. value of gas.....	159
Operating costs, 31 days, 24 hrs. per day.	
Labor, 8 men per shift....	$ 3,720.00
Water @ $1.24 per 1000 cu. ft.	1,223.88
Steam @ 80.6 per 1000 lb.	2,819.07
Coal, 1,822.3 tons @ 4.43 per ton	8,071.50
Electricity 800 KW hrs. @ 1.25 per KW.....	10.00
Coal handling with locomotive crane	55.00
Total cost for 31 days....	$15,899.45

Where economy is the watchword, Smith Clean Cold Gas Producers are found furnishing gas to the processes requiring heat. Here is a list of Smith achievements.

Annealing malleable castings for the International Harvester Co., Chicago, in continuous kilns.

Enameling sanitary ware for the Standard Sanitary Mfg. Co.

Brazing, heat-treating, soldering, melting glass, forging, japanning, and heating cyanide pots at various Ford Motor Co. plants in the U. S. and Canada.

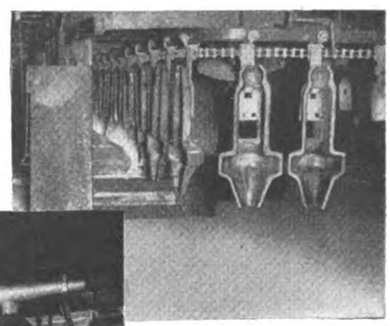
Baking foundry cores and drying molds, cooking and baking food products, baking carbons, firing pottery, operating gas engines, annealing aluminum, and melting soft and precious metals in a long list of nationally known plants.

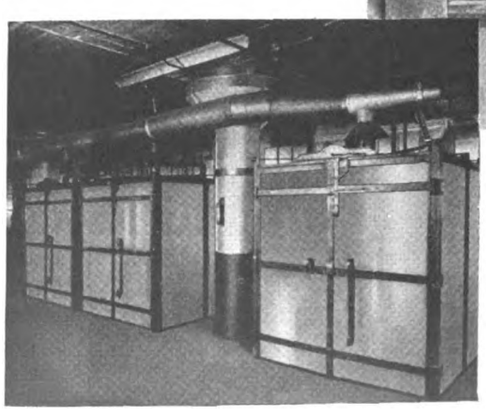
SMITH GAS ENGINEERING CO.
DAYTON, OHIO

THE SMITH GAS ENGINEERING CO.
(Manufacturing Division)

manufactures the following equipment:

Smith Gas Producers for bituminous coal, lignite, coke, charcoal, semi-anthracite and anthracite.
Tar extractors for coke oven and producer gas.
Smith Recording Gas Calorimeters.
Smith Gas Valves.
Recuperators for furnaces and ovens.
Special gas furnaces.
Bunkers, bins and storage tanks of every kind.
Scrubbers, condensers, and coolers for by-product and coke oven plants.
Trench digging machines for public service pipe lines.
Garbage disposal and rendering plants for municipalities, packing houses and the like.





Producer-gas-fired continuous brazing furnace at Ford Motor Co., Detroit, Mich.

At left, producer-gas-fired japanning ovens at Robbins & Myers Co., Springfield, Ohio.

H-5F-RTG

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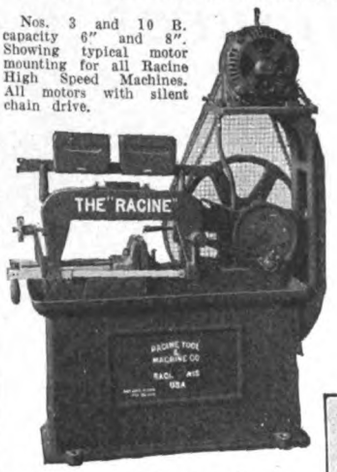
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RACINE

Are you cutting these materials most economically?

Nos. 3 and 10 B. capacity 6" and 8". Showing typical motor mounting for all Racine High Speed Machines. All motors with silent chain drive.

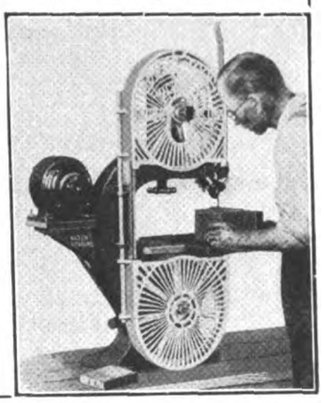


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Brass—Copper—Aluminum
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Send us your various cutting problems. Without obligation on your part, we will report to you the findings of Racine Engineers.

Racine Line Complete

The Racine line of Metal Cutting Machines is complete for every purpose. Capacities 4 to 15 inches, belt or motor driven. For the rigid requirements of the most particular work—for speed, dependability and money saving on all ordinary work—for every shop large or small.



Racine Duplex Bandsaw

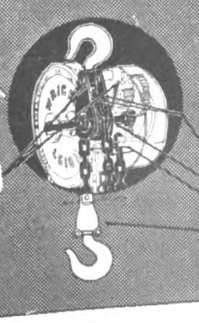
Two speeds. At high speed it will cut wood, sheet brass, aluminum and soft metals. At low speed it will cut steel and iron. Vibrationless, ball-bearing mounted wheels.

Use "Racine" H. S. Wood and Metal Band Saw Blades and "Racine" H. S. Tungsten Power and Hand Hack Saw Blades. Send for Bulletin—or let us arrange demonstration.

RACINE TOOL & MACHINE CO.
Dept. 12, Fifteenth St., Racine, Wis.
"Standard the world over"

The WRIGHT HOIST

Do you consider all chain hoists alike or do you know the WRIGHT hoist to use and specify? It is the one hoist that is different—that has forged ahead and given you a design and construction unlike any other hoist—advantages that mean a great saving in time, safety and money. May we tell you more?



Tube Oiling

Steel Safety Straps
Ball Bearing Spindle
New Process Chain
Improved Ball Bearing
Detachable Coupling

WRIGHT MANUFACTURING COMPANY, LISBON, OHIO

(*Continued from page* 88)

While there are more men used than required, at the same time, the conveyors will cut the amount of men used per sling from 20 men to 12 men. When two slings are employed, formerly 40 men were used, it will now only require the conveyors and 17 men.

In operating the conveyors, the materials are received on the floating dock or pontoon, shown in Fig. 6, elevated by means of the conveyor shown in Fig. 5 and discharged to the stationary or cross conveyors shown in Figs. 3 and 4. From these cross conveyors the bags and bean cake are ploughed off by means of adjustable discharge arrangements, and fall into steel chutes which lower the materials being handled to portable conveyor sections on the floor. These conveyors transport the material to the desired storage location and a portable elevator conveyor piles it.

In reclaiming from storage, portable conveyor units are placed on the floor and are loaded direct from the pile. The material is then transported, by means of these conveyors, to the portable elevating conveying unit which raises it to the cross conveyors, as shown in Fig. 7. From here the line of travel can either be directed to other warehouses or back to the floating dock, where the packages are manhandled into slings which are lifted over the side of the ship by means of the ship hoists. Thus the operation itself is simple. In the handling to cars, portable conveyors on the floor are directed to the nearest warehouse door and, in this manner, the material is transported directly to the car.

The wages paid per man per month under the union scale runs from about 12 to 30 rubles, or $6.00 to $15.00. U. S. gold. The railway at the present time is forced to pay from 25 to 70 rubles per man per month or approximately $12.50 to $35.00, U. S. gold. If the government, the railways, and the unions can come to an agreement, the railway will receive permission to pay a much lower salary. A lower wage rate will permit a return on the money invested, but this remains a very serious question to be settled. In the meantime, the advantage of the conveyors lies in the greater quantity of material that can be handled in a given time. By this, the railway expects to increase the number of ships that will unload at Eggersheld, for the reason that shippers are always interested in the time item.

The engineer's report, presented by Mr. Mandehr, brings out some other interesting points in reference to the erection of the equipment. Mention is made of the class of labor employed for this work. They are very much similar, according to photographs, to the Dock Walloper shown in Fig. 1. One of the peculiarities experienced, particularly with the Russian workmen, was their desire to carry out old methods, particularly that of having a rest about every hour of the day and, in many cases, their rests lasted for a full hour. This is something which the executive at home does not realize, unless he has had foreign experience, and such delay should always be taken into consideration when promising completed installation dates.

When in a foreign country, it is necessary for American engineers to conform with the traditions and customs, but frequently, if applied in the proper spirit, the injection of American pep and aggressiveness will often help in overcoming some of the old set ideas. This was the case on the erection of equipment at Vladivostok.

(*Continued on page* 92)

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Four proved suggestions for *Cutting Maintenance Costs*

Many of the leading industrial plants in this country have reduced the amount of money it takes to keep their buildings in repair. This page tells how they do it.

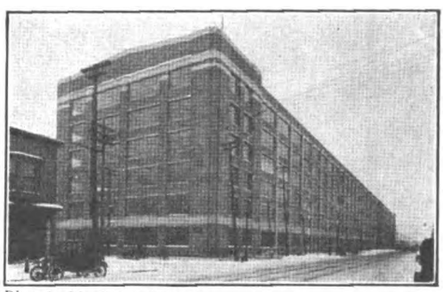


Photo by MacGregor & Vallin

Above is the world's largest body plant—the Fisher Body Company, Detroit, Mich. The concrete floors of this plant are dustproof, wearproof, waterproof, for the entire floor surface has been treated with Lapidolith, the liquid chemical floor hardener.

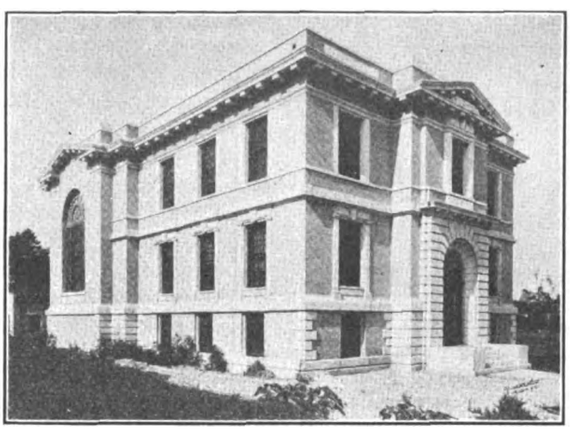
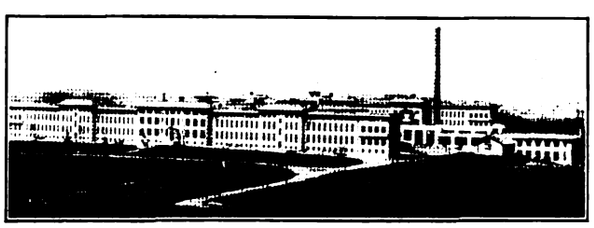


Photo by Wurts Bros.

No matter how hard it rains, water cannot seep through the walls of the Commercial Cable Building at Far Rockaway, Long Island (at left). The exterior surface has been thoroughly waterproofed by an application of Hydrocide Colorless.

The snow-white exterior of the State Tubercular Sanatorium at Hamburg, Pa. (below), owes its refreshing appearance to 3000 gallons of Exterior Cemcoat, the paint that stays white.



FLOORS—You seldom see that concrete floors are wearing until the actual need for repairs is close at hand. Then it is too late to forestall maintenance expense.

The first outward sign of floor wear is silicate dust that fills the air and damages equipment, merchandise and machinery. Holes, hollows, cracks and worn patches quickly follow in its wake and then you have some repairing to do or a new floor to lay. If you take the floor in time, however, and treat it with Lapidolith, the liquid chemical floor hardener, you will have a floor that is permanently dustproof and wearproof.

Lapidolith penetrates the concrete quite a distance. By chemical action the loose coarse-grained particles are changed to a fine, even, close-grained substance of crystalline formation. This substance is flintlike in its hardness. It needs no further attention for years, no matter what kind of wear it gets. Lapidolith is simple to apply. It can be flushed on either a new or old floor and if applied at night the job is complete by morning.

If your floors are of wood, do not bother with messy floor oils that merely lay the dust and have to be applied again and again. If you would really prevent floors from rotting, splintering and drying out, treat them with Lignophol, the preservative floor dressing that restores the natural oil and gum of the wood. Lignophol is non-inflammable; one application lasts for many years and keeps floors smooth, hard and sanitary.

PAINTED SURFACES—Painting is one job a plant must always do, but how often is another story. Interiors and exteriors require less painting where Cemcoat is used. This gloss, eggshell, or flat enamel paint stays white long after other paints yellow with age. A Cemcoat interior looks bright and cheerful. It can be washed over and over again, and each time the paint shines forth as bright and clean as when it was applied.

Cemcoat does not crack or peel even on a brick or concrete wall. It is not affected by free lime—always found in such a wall—which quickly spells the finish of most paint. Cemcoat is made in white or colors for both interiors and exteriors.

EXTERIOR WALLS—If moisture seeps through your walls in a driving rainstorm, coat them with Hydrocide Colorless, the perfect waterproofing for brickwork. It does not impair their natural beauty in the slightest. Hydrocide Colorless is applied on the outside of a building, but its presence cannot be detected. It penetrates the brick. It contains no paraffin, and hence does not run in hot weather; it does not collect dust; it can be painted; it keeps buildings permanently dry and warm.

ROOFS—If your roof leaks, Stormtight will quickly and permanently make an end of the trouble.

This thick, elastic, rubber-like compound adheres to any surface, wet or dry. It can be applied by anyone over any roofing material.

Either a small leak, or a large one, can be repaired with but little expense of time or trouble and at small cost. At the same time an entire roof surface can be made lastingly waterproof with Stormtight. Many an old roof about due for replacement has been made as good as new by an application of Stormtight, thus saving the owner the cost of re-roofing.

For years the leading industrial plants of this country—such plants as Ford Motor, Standard Oil, Bethlehem Steel, Swift & Company—have kept down their maintenance costs by using some or all of the above products. It will pay you to know more about these products. Sign the coupon below and return it to us today for free sample and complete information.

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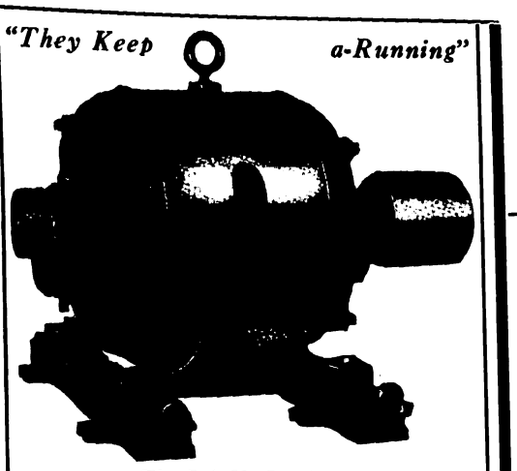
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"They Keep a-Running"



The 7½ H. P. Motor

Specially Adapted for Automatic Control

For more than 21 years Century Repulsion-Start Induction Single Phase Motors have been meeting the severe requirements of automatically controlled equipment. The governor mechanism has been provided with case-hardened pins and studs and phosphor bronze bearing surfaces. This assures thoroughly satisfactory operation in the most exacting installations such as home, and commercial refrigerating units, house pumps, heat regulators, sewerage disposal systems, drinking fountains, garage air compressors and similar equipment.

Century Type RS Motors start as repulsion motors. As the motor accelerates to full speed, the governor releases the brushes from contact with the commutator, at the same time sliding short-circuiting segments into contact with the commutator bars. This effectively short circuits the windings and causes the motor to operate as an induction motor. In most cases the brushes "ride" the commutator only 1-900th part of the time that the motor is operating—with the result that brush life is unusually long.

Type RS Motors can now be furnished with the new Century Wool-Yarn System of Lubrication in fractional horse power sizes.

Built in all standard sizes, from 1/8 to 40 horse power—temperature rise not more than 40 deg. Centigrade.

Send for Bulletin No. 29

Bulletin No. 29 describes all superior features of Century Repulsion-Start Induction Single Phase Motors—a copy will be mailed to you on request.

CENTURY ELECTRIC COMPANY
1827 Pine Street **St. Louis, Mo.**

29 Stock Points in the United States and More than 50 Outisde Thereof

⅛ to 40 H.P. Century MOTORS ⅛ to 40 H.P.

(*Continued from page* 90)

Here the engineer decided to treat his men right and work along with them, although this was advised against, according to custom. At first the men took advantage of his working and stood by to watch it, but, after a few days, they tried to emulate him and accomplish the same amount of work in the same time; thus an automatic competition was set up by placing an example of quick work before the men instead of continually haggling about their slowness.

In speaking of this experience the engineer says that he was told his prestige would suffer if he performed manual labor. He feels that no person is justified in making a statement to that effect and then expecting it to apply to all and everyone involved in foreign work. For example, at the completion of the work, a little party was arranged for the workmen, and to show their appreciation the engineer was bounced high into the air by different groups of men, and to again express their feelings they all were at hand to see him leave the town of Vladivostok. He was then told that it is a rare instance when foreigners have worked with a bunch of Russians that one is sent off with the best wishes of all those who came in contact with him.

Some of the points brought out in this article are applicable only to foreign installations but many of the conditions apply directly to our own American ports. Here we have conditions that the average shipper does not realize. As, for instance, the Merchants' Association of Greater New York found upon investigation of the handling methods in the Port of New York that frequently the labor charges for handling materials from dock floor to truck tailboard were *more than the charges for transporting the same materials from England to New York*. This condition was, and is, entirely due to the present handling methods where the stevedore labor unions control the docks, and not the ship or dock owners. Any condition of this nature which has a direct effect on the cost of receiving or shipping any commodity is of direct importance to all shippers. It would, therefore, be well for some industrial executives to investigate some of the handling charges they are now paying in connection with the handling of merchandise at warehouses, steamship piers and freight terminals.

After all, the conditions now prevailing at Eggersheld in the Port of Vladivostok are no different than those which can be found at a number of our ocean, lake, and canal terminals.

THE real purpose of all surveys of wages, salaries, and employment is to ascertain the nature and extent of the buying power of the many—and the entire fabric of business activity rests upon the ability and inclination of the populace to buy things.

Naturally, the trend of employment and wages is spotty, since each industry is governed by its own peculiar conditions. In the case of leather goods and of wearing apparel, as in many other lines, there are seasonal changes in the number of workers and in the total wages. But recent seasonal declines in these lines are offset by seasonal increases in other lines, as in the building and construction trades and in outdoor employment of all kinds.—*La Salle Extension University.*

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ADVANTAGES of truck power over man power are obvious to all. But yet some manufacturers still use man power and also hand regulation of temperatures.

Manufacturers the world over are equipping their plants with *Tycos* Controls as fast as their own conditions will permit them to do so.

Tycos advantages are many. Here are listed a few things *Tycos* controls will do for you:

Insure uniformity of product

Cuts down process time

Increase batch or process production

Cuts out rejections because of under or over heating

Tycos Catalogs are available for all industries. Write now. Mention the ones you desire. No obligation.

Taylor Instrument Companies

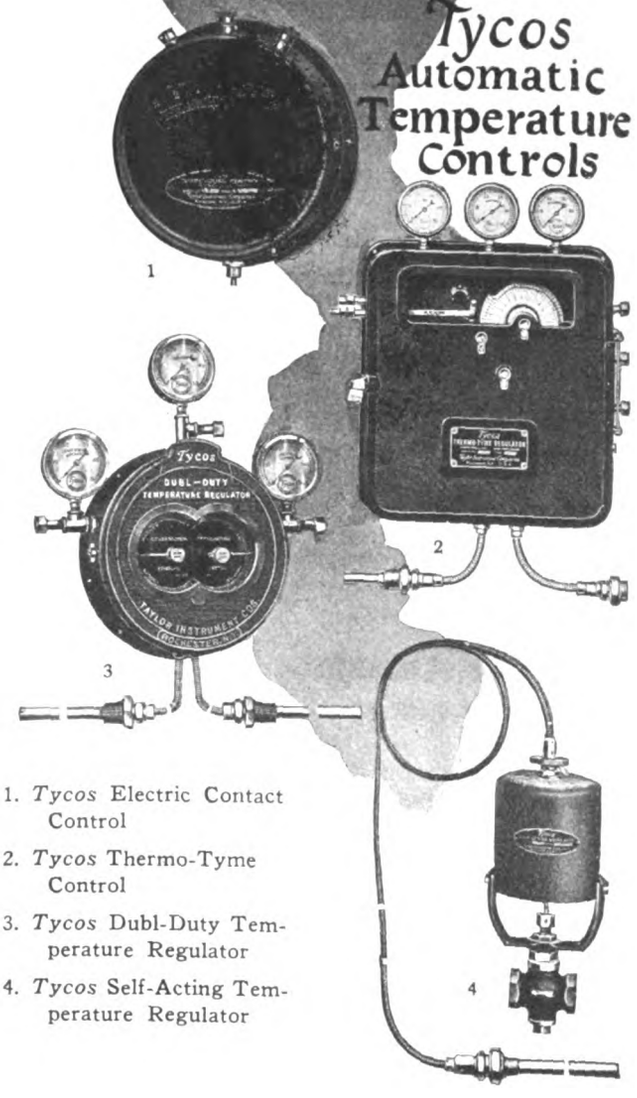
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This 24 foot Conveyor at $490.00



An adjustable wheelframe, ball bearing, three-phase motor including conductor cord plugs and receptacle or 3 H. P. gasoline engine with clutch.

Will Pay for Itself in a few Months

First cost and handling costs on this Drag Conveyor are insignificant. No belts to wear. That feature alone saves you $60 to $200 annually. The Chicago Automatic will pay for itself many times over in a year's period.

Made in belt and bucket type. Shipped ready for instant service. Order one to-day.

Chicago Automatic Conveyor Co.
982 Old Colony Bldg., Chicago, Ill.

Storing coal direct from car with a Chicago Automatic Conveyor.



How Do You Buy Belting?

(*Continued from page* 17)

always the belt which costs least when applied. Repairs and maintenance enter into the problems, and also the possible loss of production caused by machinery shutdowns when the belt fails during working hours. When this last item is fully considered it is plain that a little more money spent originally for a better belt will probably save many times its value in avoiding production losses and the wages of idle labor.

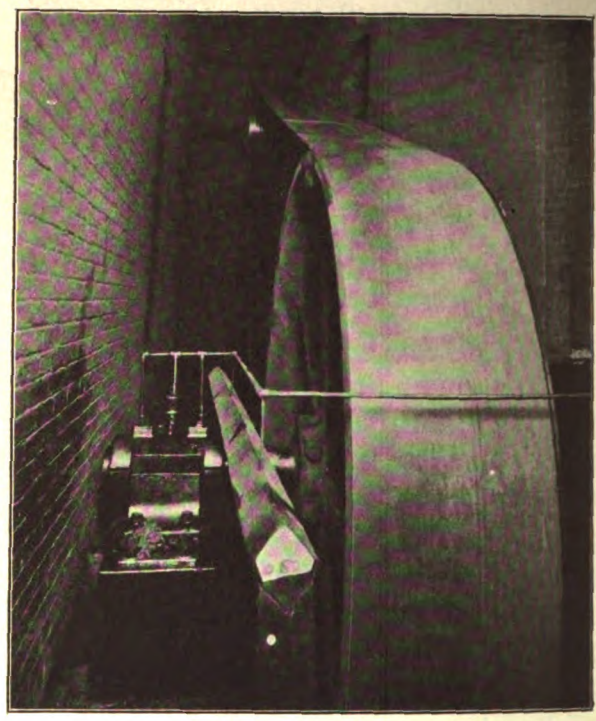


Fig. 11. A main drive in a lumber mill at Louisville, Kentucky, showing a large pulley at the engine end of the drive.

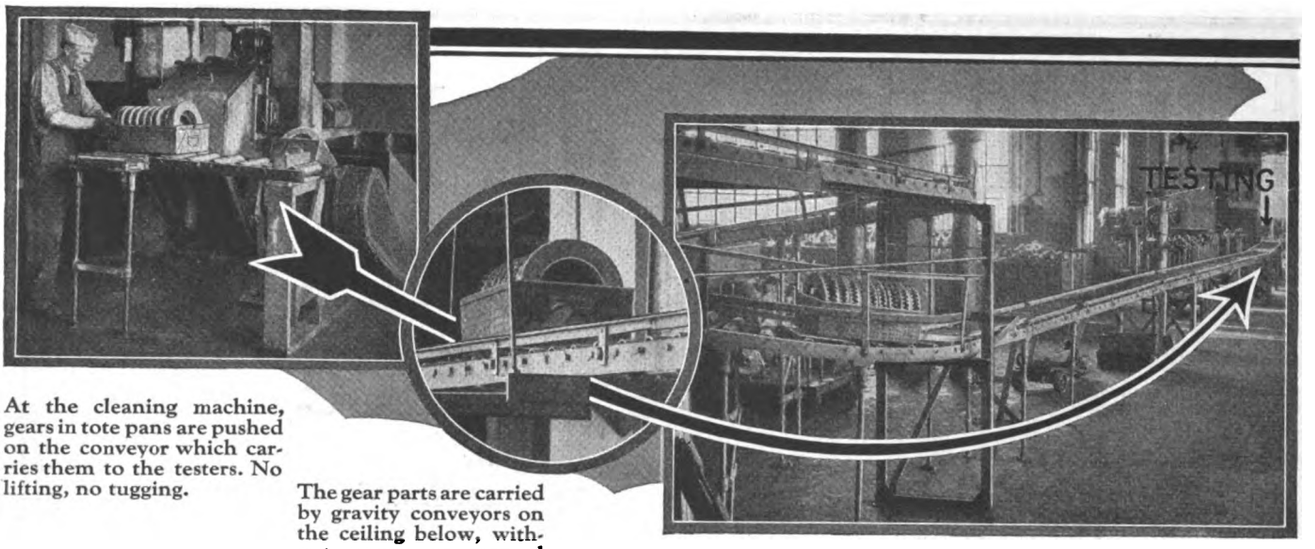
The amount of power transmitted by a belt depends upon the velocity at which it is running, the tension under which it is placed on the pulleys, the arc of contact of the belt with the smaller of the two pulleys, and the general conditions of service.

A belt can be made to transmit almost any power desired, within the practical range of belt velocities, and up to the limit of its strength, by increasing the tension. But high belt tensions mean high bearing pressures, resulting in an increased expenditure of power for overcoming line shaft friction, as well as high maintenance and repair charges for the belts, and frequent belt failures.

Thus, the use of heavy belts and comparatively low tensions is in accord with the best practice today. This will be found to give the most satisfactory service as well as the lowest total cost for belting, bearings and power. These statements are made largely on the results of the investigations of two eminent engineers, Frederick W. Taylor and Carl G. Barth, who have given many years of intensive study to the development of formulas which will enable belt designers to specify, not the lightest belt which will transmit a given power, but the belt which will transmit the power most effectively and economically in the long run.

(*Continued on page* 98)

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At the cleaning machine, gears in tote pans are pushed on the conveyor which carries them to the testers. No lifting, no tugging.

The gear parts are carried by gravity conveyors on the ceiling below, without power, or manual handling.

A moment after they leave the cleaner, the gears are delivered to the testers. The testers always have material ahead—they are never delayed by slow, inefficient porters.

Cuts out the long haul

IN handling materials, it's the long haul that costs. The diagram shows how the New Process Gear Co. hand-trucks 4000 gear parts a day over the length of their Syracuse plant. The porters' wages and trucks incurred large and needless expense. Materials were delayed waiting for a porter, and waiting at the elevator. The testers, at the receiving end of the line, had either a feast or a famine of parts.

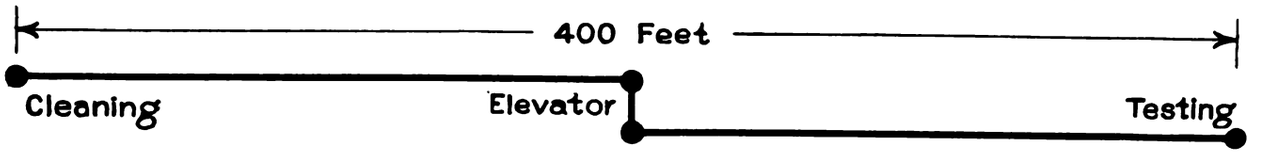


Diagram showing old, costly method of long-haul hand trucking

Now, the gear parts are carried easily, cheaply, over a Lamson conveyor system. The tote pans of gear parts are pushed from the cleaning machine to the rollers of the conveyor. They are not touched again until they roll into the testing department station. During their trip through the plant, they are moved by gravity—without expense, without bother. This system saves money and time, and keeps the testers always supplied with work.

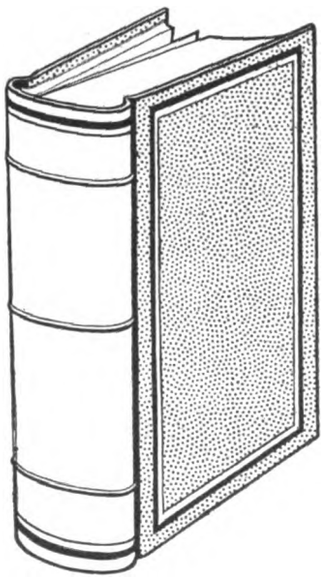
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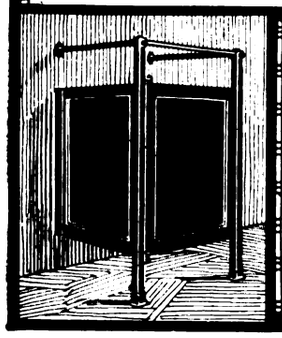
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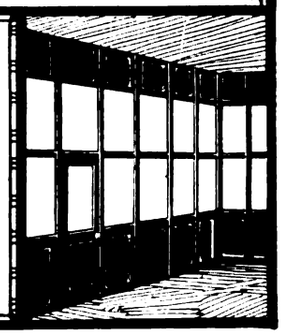
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(Continued from page 94)

The practical conclusions reached by these two men have been amply justified by the results obtained during the last twenty years in the thousands of factories where their system of design and the related system of periodical maintenance and inspection have been adopted as standard practice.

Belting may be compared in many ways to horses. There is a type of service requiring a long, strong, steady pull at a comparatively slow speed. This is draught horse work. Then there is the service that requires high speed and light pull. This is race horse work. The two varieties are illustrated by numerous examples herewith.

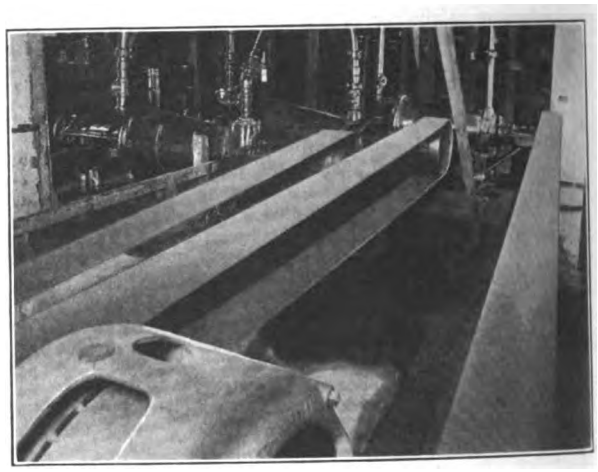


Fig. 12. Another view of pulp grinder drives in a California paper mill.

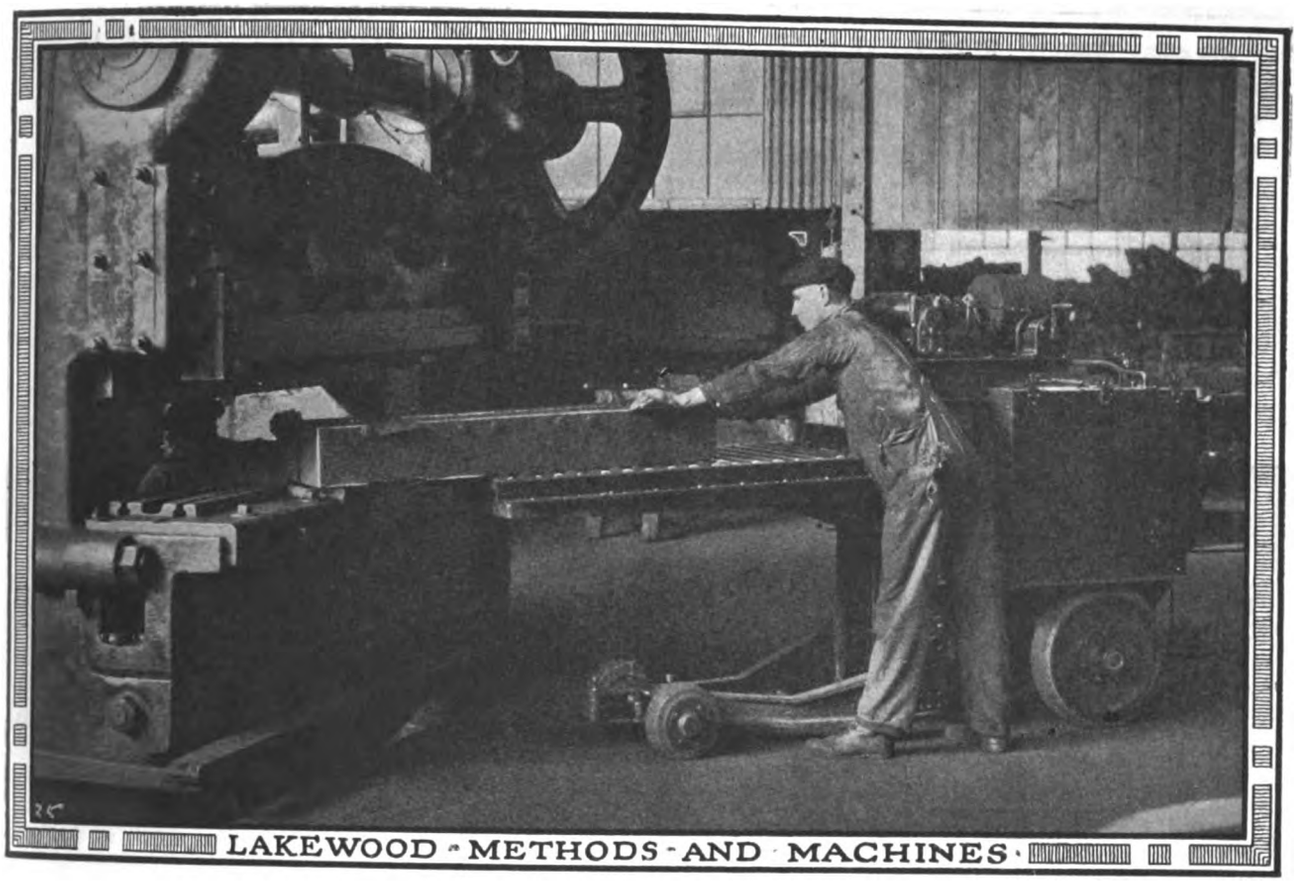
Fig. 1 shows two rolls of the draught horse type of belt. Fig. 2 is also a draught horse belt, 60 inches wide, running three-fourths of a mile a minute.

Fig. 3 shows a typical race horse type of belt; light, very pliable, yet strong. Fig. 4 shows how belting of this type may be used on wood-working machinery.

Fig. 5 is unique in that it is a combination of the draught horse and race horse types of service. Here a 10 inch wide belt running at 5,600 ft. per minute drives a hot metal saw in a steel works, transmitting 30 horsepower.

The other illustrations shown here have been selected to show varying conditions of use, from light, fast service to heavy, steady bull-dog pull. In every case the point at issue has been to illustrate the advantage of using comparatively heavy belts at low tension yet positive "grip" for the purpose of securing long belt life, uninterrupted operation, and low final cost.

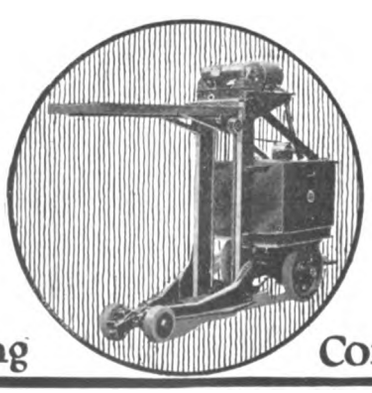
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Of INDUSTRY ILLUSTRATED, published monthly at New York, N. Y., for April 1, 1925.

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Before me, a Notary Public in and for the State and county aforesaid, personally appeared John H. VanDeventer, who, having been duly sworn according to law, deposes and says that he is the Editor of INDUSTRY ILLUSTRATED, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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JOSEPH A. BURLANDO.

(My commission expires March 30, 1925.)

The Dollars and Sense of Safety

(*Continued from page* 29)

stalled as a matter of course while a nearby strip of flooring is left smooth from wear of spattered oil, throwing the unsuspecting victim into the machine in a manner not anticipated when the guard was designed.

A machine placed in a dark corner becomes a hoodoo with a long list of victims until it is moved into the light where the operators regain confidence, and it is again a harmless piece of apparatus needing only moderately careful handling.

The effect of fear on the worker—the constant strain of guarding against mutilation—often brings about the catastrophe he is endeavoring to avoid. Inevitably it lowers his morale, fatigues him unnecessarily and decreases his production.

No other function of industrial management so intimately affects the entire organization, and especially the relations between employer and employee. In removing hazards and improving working conditions, it removes real causes for discontent. Further, it provides an opportunity for management and labor to get together on a subject of mutual advantage containing no inherent seeds of contention.

In the inauguration of safety measures, it is of primary importance that responsibility be centralized. Every department can assist, in fact must assist if the best results are obtained, and every department profits directly or indirectly by the successful carrying out of the work. It is simply following out a recognized law of management to place the responsibility with an individual who is capable of coördinating the efforts of the different departments and at the same time will make use of every outside source of practical and technical assistance. If this man is a trained safety engineer all the better, but if the industry cannot afford, or thinks it cannot afford an additional salary, some one in the organization should be designated to carry out the work.

I have made little mention of the humane side. Only the demagogue on his soap box believes or pretends to believe that the shop executive, office executive or stockholder is an inhuman monster indifferent to death or maiming and the consequent misery and suffering of the victim's dependents. He may look upon accidents as the unavoidable sacrifices of the present day complex civilization; he may be in the unprogressive toils of the "inevitableness of things as they are" complex; he may believe the carelessness of the workers more responsible than the factory management, but prove to him with cold logical facts that accidents can be prevented and workers protected from their own carelessness and he is more than ready to do his part.

This is distinctly the job of the safety engineer and the safety organizations, and it is quite as much their job to prove by facts and figures that safety should not be regarded as a philanthropic undertaking but as a straight business proposition.

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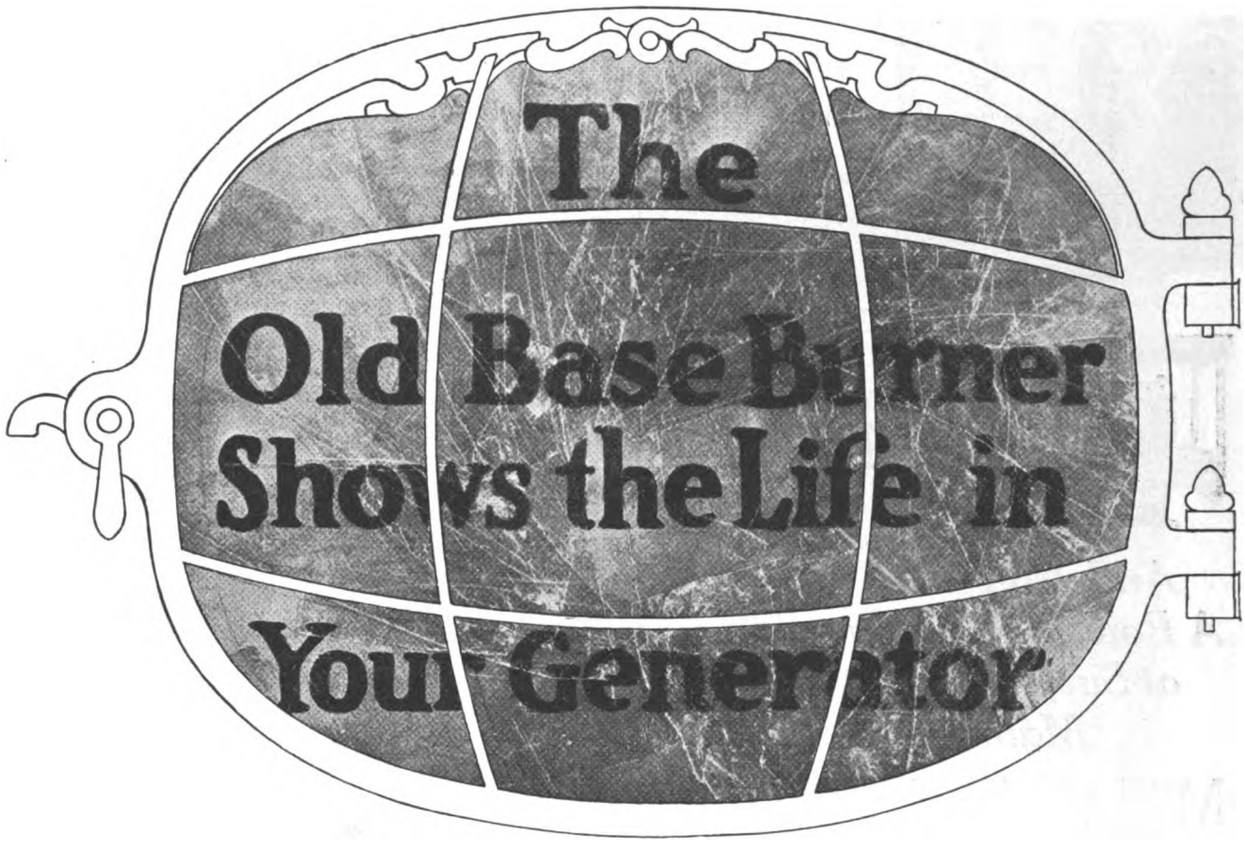
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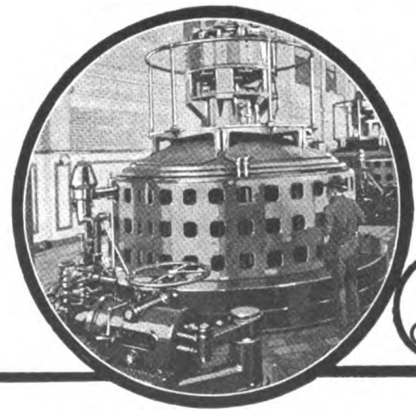


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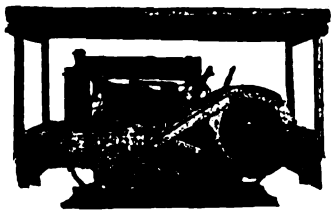
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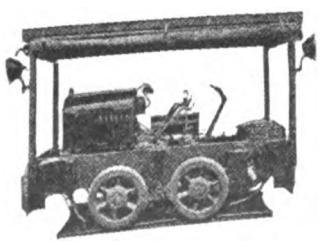


The Brookville FORDSON Locomotive

And Now— A Powerful Haulage Unit at Surprisingly Low Cost Maintenance

MOST industrial track haulage requirements do not warrant costly equipment. Many plants now have exceptional power and efficiency in their haulage units through the Brookville Fordson Locomotive—all the strength and power of the Fordson Tractor plus the low cost maintenance and long life of the Fordson Motor.

The Fordson Locomotive is ideal for industrial track haulage. It is low in first cost, simple in construction and easy to operate. Small drive wheels, short wheel base, spring suspended throughout. The Brookville is giving 100% satisfaction over the roughest and crookedest track.



The Brookville Ford Ton Truck Locomotive is used where lighter loads are handled. The power unit is Ford one-ton motor equipped, including Ford Motor, transmission and differential. Our folders give complete specifications on both these units. *Write.*

Brookville Truck & Tractor Company

BROOKVILLE, PENNSYLVANIA.

See Our Exhibit at the Ford Power Equipment Exposition, New York

Industry Crosses the Great Divide

(*Continued from page* 19)

To-day, the Pacific Empire is rising in rich lands around the Father of the Oceans. The American West, directly connected with the brains and wealth of Atlantic shores by great rail systems and the gateway of the Panama Canal, leads in the commercial and industrial development of this new-old Pacific amphitheatre of super-resources and a balmy, Riviera climate.

Industry, ever eager to grasp new opportunities, follows close behind miners and farmers. The white, glistening cities of the West, with their bungalow homes and scenic settings, draw to their flanks half a hundred lines of industry. Here they find assembled natural resources, power of water and oil, rail and water transportation, a home-owning labor, an expanding domestic and export market—all the factors of successful production except industrial maturity and traditions, and that will come.

The West's earliest monster industry—and everything out West is on a large scale—was under the earth—gold,

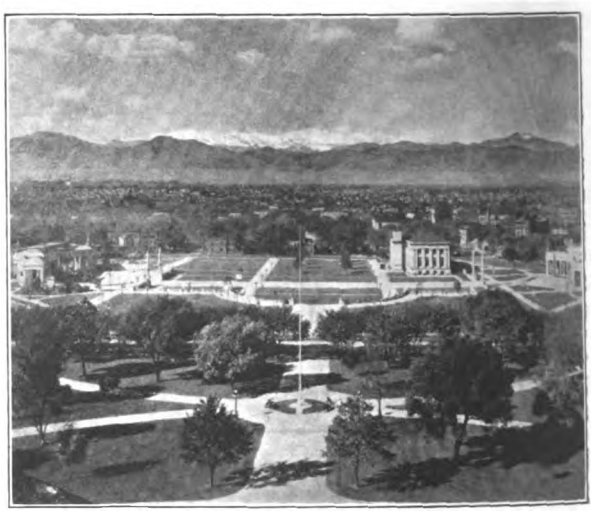


Fig. 10. In the heart of the Rockies are great cities of diversified manufacturing and beautiful surroundings like Denver, shown here, and connected by fast freight with both Eastern and Pacific markets.

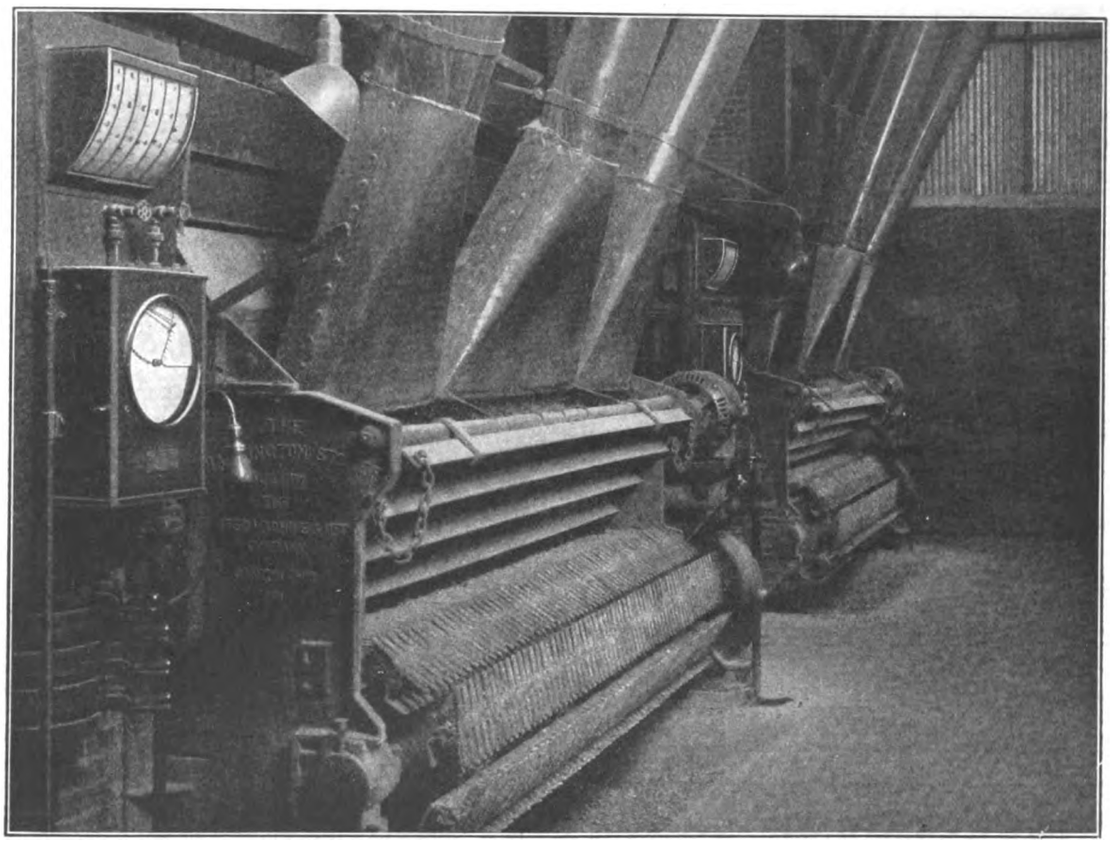
silver, copper mining. Today, mineral stores provide the base for incoming paint, chemical and clay industries, whether at Sacramento, Denver, or as the most important development in the 139 new industries which located in Washington state last year, new industrial chemical lines ranging from cosmetics to nitrogen products.

Not only the country's greatest hydro-electric energy, with three planned developments near Portland alone, each larger than Muscle Shoals, not only a universal use of fuel oil, from Montana fields to the great California gushers, but also the utilization of magnificent coal beds in the Northwest and the Mountain States, with iron ore lying contiguous, and the accomplished facts of the Colorado Fuel and Iron Co., and the Columbia Steel Corporation near Salt Lake City, give a start to a growing iron and steel industry, while sixty foundries in California alone find the electric process as efficient as coal. Iron and steel and metal products of all kinds are

(*Continued on page* 106)

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BAILEY METERS



Increase Boiler Room Efficiency

Every power plant engineer is vitally interested in power plant efficiency and anxious to adopt ways and means of increasing the economy as well as the capacity of his plant with the least expenditure. The first step is to locate and determine the magnitude of the losses so as to be able to reduce them to a minimum and thereby improve the final results.

You can determine the fuel and stack losses as well as check the fuel, steam and water consumption by the use of Bailey Meters.

Practically all of the Central Stations and the largest power users throughout the country are controlling boiler operation by the aid of Bailey Boiler Meters and Multi-Pointer Gages.

The above installation shows a Bailey Boiler Meter for recording Steam Flow from the boiler, Air Flow used for combustion and Flue Gas Temperature on one chart. Above the recording meter is a Bailey Multi-Pointer Gage indicating Main Duct Pressure, four Compartment Pressures and Uptake Draft.

BAILEY METER COMPANY

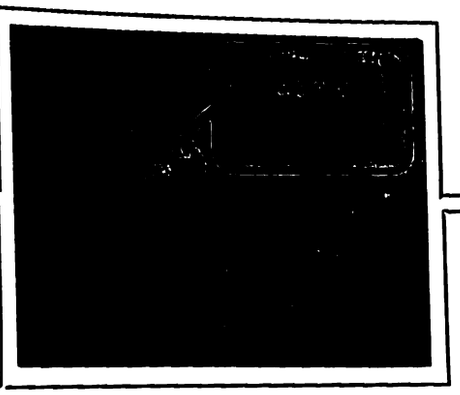
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"Since installing your Productimeters on our automatic screw machines we have eliminated overruns and shortages, saving much waste that previously resulted from carelessness on the part of operators.

The Productimeter
The Speedometer of Industry

"Accurate costs can be determined only by knowing the relation of production to waste material. Our Productimeters give us this—instantly—and have raised the efficiency of our plant is a very gratifying degree."

That is another concrete instance of how The Productimeter reduces costs. Let us send you at least one for 30 days' free trial.

DURANT Manufacturing Company

608 Buffum St. (1785) Milwaukee, Wis.

AN INVESTMENT In Better Work

GIVE your men the vital benefit of clean, cool drinking water, and they'll give you better work and more of it.

Over 8,000 companies in 200 lines of industry are using MEECO Coolers to increase the efficiency of their workers during hot weather.

MEECO Coolers use less ice per man per season than other types because the tank and coil capacity is scientifically designed to supply a greater number of men on each charge of ice.

The MEECO guard-bowl and slant-stream bubbler insure sanitation. No MEECO Cooler has ever worn out. Many have done steady service for over 15 years.

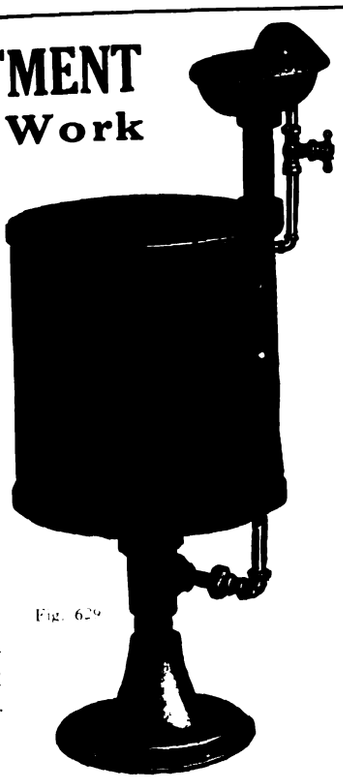


Fig. 629

Write for Catalog giving full details and prices

Lockers Sanitary Washbowls METAL MEECO PRODUCTS *Shelving Chairs Partitions*

MFG. EQUIPMENT & ENGINEERING CO.
Originators and World's Largest Makers of Ice-Cooled Drinking Fountains
FRAMINGHAM, MASS.

(*Continued from page* 104)

now manufactured in the West, such as forgings, castings, plows, machinery, tin cans, General Electric products, Pullman cars, steel ships, pumps, valves and what not.

The West's vegetables, apples, prunes, raisins, are packed and canned in scores of large factories at all points, Heinz, Del Monte, and Libby, McNeill & Libby being examples. Salmon leads a widespread fishing activity, and numerous plants from Alaska to Mexico send canned fish to all quarters of the globe.

The West's two-thirds of the country's timber is the base not only of cheap housing, and of water exports to New York and China and between, but also of furniture, veneer, and wood products industries. Portland on the broad Columbia makes doors, chairs, veneers, boxes, to mention some, and has within its area another lumber offshoot, great paper and pulp mills, whose main product is news print, but many of whom turn out waxed

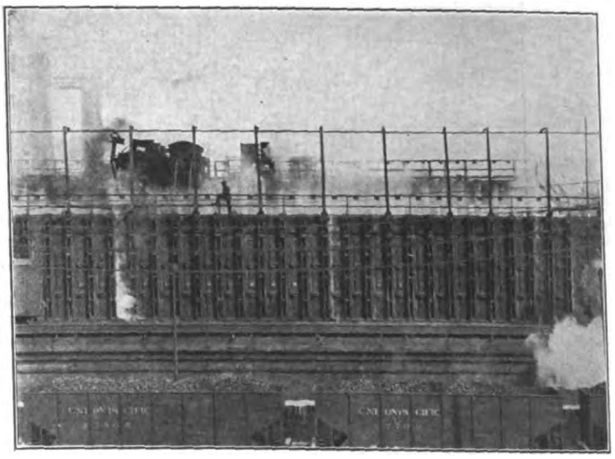


Fig. 11. Iron and steel in the West. The coke ovens of the Columbia Steel Corporation at Ironton, Utah, near Salt Lake City.

and fancy papers. All wood products, from matches to ready-cut houses, are now being manufactured in the West.

The livestock found on every plateau and plain call for numerous packing plants and tanneries, and the by-products are building up soap and fertilizer concerns. Shoe factories are filtering in to provide part of the $90,000,000 worth now bought from Boston and St. Louis.

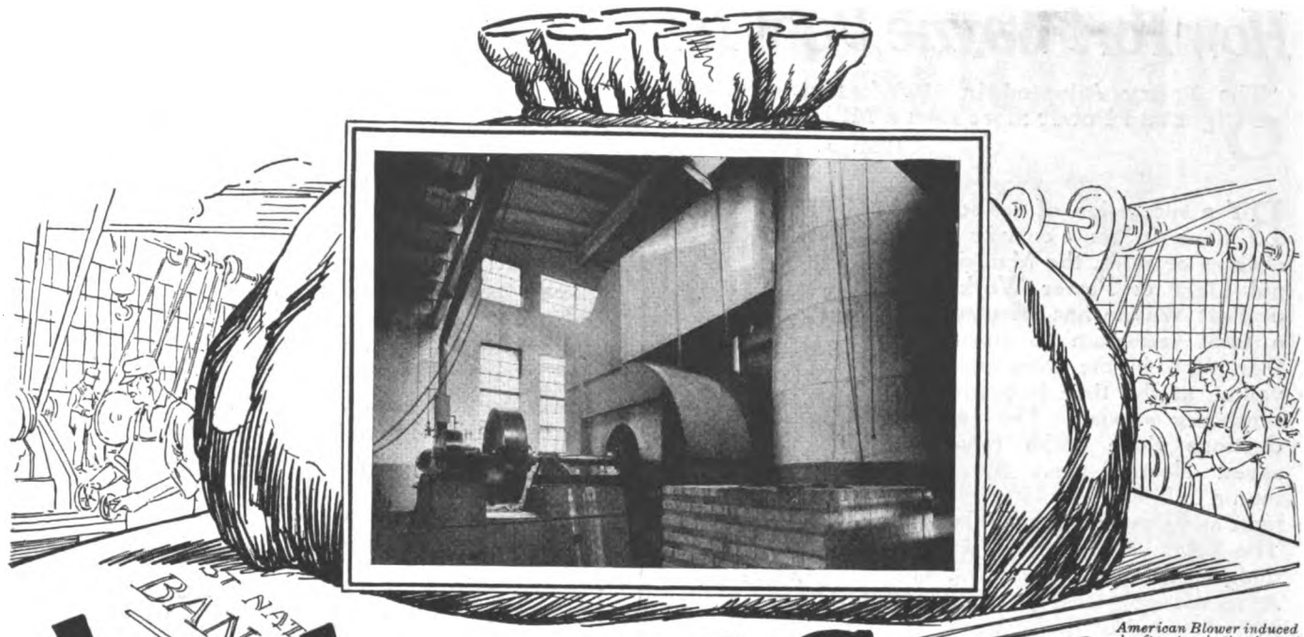
A motor industry of proportions is now an accomplished fact here, with Fageol, Ford, and Durant cars, trucks and busses, Goodyear and Columbia tires, Fisher and Martin-Parry bodies, and numerous gears, bearings and accessory concerns, as part of the motor ensemble. The West leads in cars per capita, and the Pacific Empire calls for motorized transportation. Orient rubber, local wood and steel, a new cotton growing industry for tire fabrics, expert mechanics, are the other factors.

If New England and the South provide textiles to the Atlantic tier of nations, then the West will furnish the Pacific's 700 millions with cloths and garments. The Oregon and mountain wools, of finest quality, augmented with mixed wools from Australia, supply the Northwest's woolen mills, turning out cloths, blankets, garments.

The nation's silk imported from Japan passes first

(*Continued on page* 108)

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American Blower induced draft system in the plant of the Michigan Carton Company, Battle Creek, Mich.

An Actual Saving of $2,500 a Year

in Repairs Alone ~

Ample power, though cheaper, poorer grades of coal are burned, and a most noticeable reduction in the cost of arch and boiler tube repairs are a certainty in power plants where American Blower Induced Draft Systems are in operation.

Frequently the saving effected totals thousands of dollars each year. Evidence of huge savings come to us from power plants in all sections of the country where American Blower Induced Draft has replaced ordinary methods.

The following statement by W. I. Fell, President of the Michigan Carton Company, Battle Creek, Michigan, is typical:

Read what this Manufacturer says

"Formerly our seven boilers (of 25,000 horsepower) had to be forced very hard and 'bottled heat' resulted in arch repairs costing some $2,400 a year and tube repairs of $800 more.

"The American Blower System cut our arch repairs 75% and tube repairs 90%—thus saving us enough in repairs alone to pay its total operating cost, including interest, depreciation and power.

"In 24 hour service, 6 days a week, for a year and a half it has given us great satisfaction and required no attention but lubrication.

"With this equipment we get higher efficiency out of our coal, develop more power, save thousands in costly shutdowns and avoid $2,500 of troublesome arch and tube repairs."

Write today for our latest bulletin describing American Blower draft equipment both forced and induced.

AMERICAN BLOWER COMPANY, DETROIT

BRANCHES IN ALL PRINCIPAL CITIES

CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

(442)

American Blower

"Sirocco" TRADE MARK

VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

Manufacturers of all Types of Air-Handling Equipment — Since 1881

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How Fort Wayne Does It!

"The Policy Adopted in 1908 has saved Users of Light and Power more than a Million Dollars."

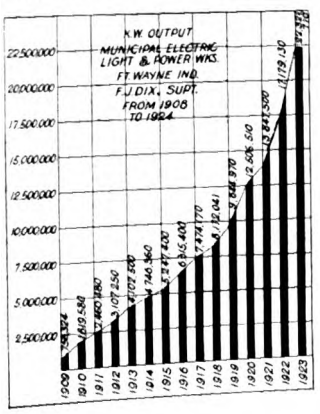
WM. J. HOSEY,
Mayor.

BY a succession of reductions in its service charges or rates, the Municipal Light & Power Works of Fort Wayne has effected a total reduction of more than 46% in the rates prevailing at the time it began rendering service. The reductions since 1908 have saved electric users more than a million dollars in their light and power service bills. The original investment in this plant was $336,000.00. A recent appraisal put the present value of the plant at $1,534,271.39. This increase in valuation of $1,200,000.00, has all been paid for out of earnings.



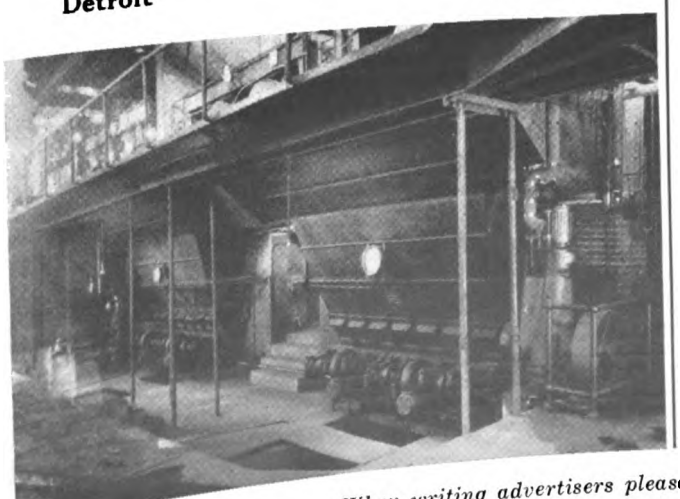
Detroit Stokers are closely identified with the history of the Fort Wayne Municipal Light and Power Plant. Between 1912 and 1920, five boilers comprising 3,200 horsepower equipped with Detroit "V" Type Stokers were successfully operated in the plant.

With the demand for high ratings coming on from the plant three Detroit Multiple Retort Stokers have been installed and in January, 1925, a further order was placed for an additional Detroit Underfeed Stoker.



The Detroit Stoker Company is very proud of the fact that its equipment has been one of the principal factors in the profitable operation of the Fort Wayne plant. Other light and power properties, whether privately or municipally owned, are invited to send for further information of the Fort Wayne installation. In writing, ask for Bulletin 129.

DETROIT STOKER COMPANY
129 General Motors Building
Detroit **Michigan**



(*Continued from page* 106)

through the port of Seattle. Only Eastern capitalists and a nucleus of skilled workers are needed.

Cotton is already grown successfully in California and Arizona and nearby Mexico. The boll-weevil is unknown.

All textile advantages are here. Electric power, basis of textile machine energy is plentiful. Half a billion dollars in textiles and clothing is now bought from the East by the Western market, while the export possibilities are as vast as the Pacific.

Oakland and San Francisco, with San Jose and Sacramento nearby, in the strategic heart of the Coast, are centers of diversified manufacturing. A hundred industries came to Oakland last year.

Portland leads in furniture, paper and pulp, and woolen goods. This city is the metropolis of the Columbia River Empire, the Nile Valley of the West. At its Eastern end is Spokane, white capital of a wide expanse of inland wealth. Seattle taps a region extending from

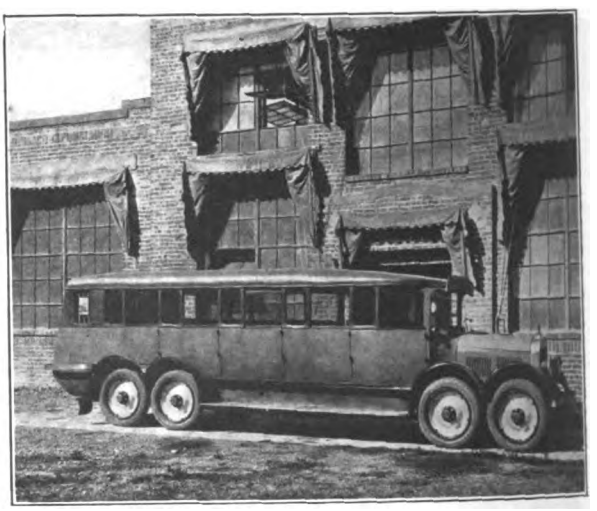


Fig. 12. This eight-wheel autobus of the Great Western Motors Co., at San Jose, Cal., is significant, first, of a growing auto and tire industry, and second, of the West's modern transportation throughout the Great Open Spaces.

Washington to the North Pole, and grows accordingly.

Los Angeles and San Diego are the New Orleans of the West, gateways to the enormous Southwest and its agricultural and industrial possibilities.

Great Falls, in Montana of fabulous mineral wealth, has water-power, oil, gas, coal, iron, copper, wheat all round it. It is typical of the prodigal possibilities with which nature has endowed the West, storehouse of a continent.

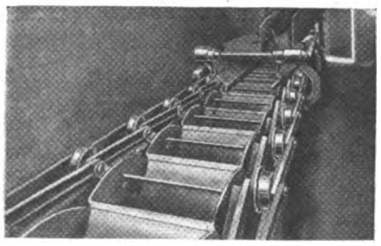
Denver and Salt Lake City are the twin kings of the Rockies, each blessed with rich agricultural and livestock areas, with coal and iron, with radiating railroads, with diversified manufacturing catering to growing plateau kingdoms,—and the West is so large that a dozen Eastern states could be tossed in any corner of it—and each with superb mountain scenery and civic life.

The West has one danger—it must stop speculation in land and natural resources, the dread poison that eventually raises the price higher and higher against the needed settler, and consuming industry and labor. The West will keep on growing as it keeps at a reasonable price natural resources, home and industrial sites, and lands for farmers.

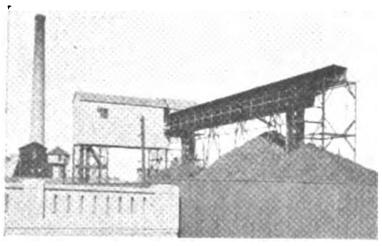
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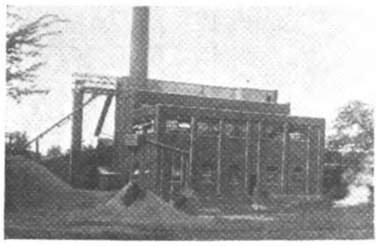
G-W Equipped Power Plant. Manhattan State Hospital, Ward's Island, N. Y. Bunker Storage—1,000 tons. Ground Storage—30,000 tons.



G-W Pivoted Bucket Carrier installed at above plant. Capacity—60 tons per hour.



G-W Ground Storage Plant. Desbrock & Co., Brooklyn, N. Y. Storage Capacity—8,000 tons.

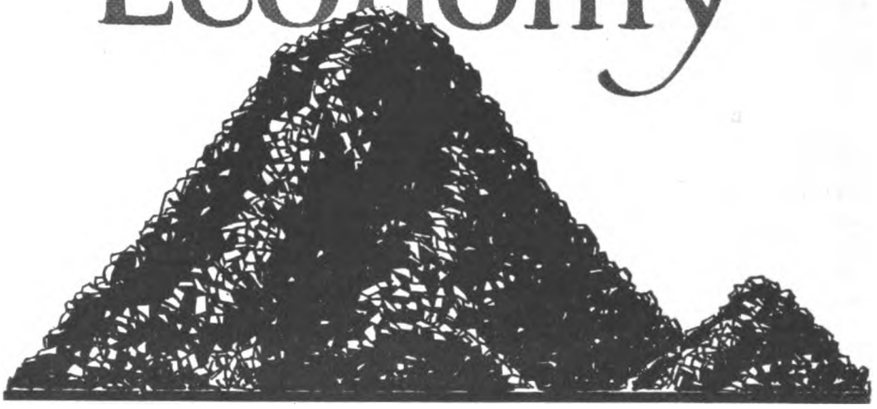


Municipal Power Plant, Herkimer, N. Y. G-W Equipped. Bunker Storage—180 tons. Handling Capacity—40 tons per hour.



G-W Portable Flight Conveyor. George Hall Corpn., Ogdensburg, N. Y.

Coal Handling Economy



Whether you handle 500 tons a day or merely 5

—there is some form of time- and labor-saving G-W Equipment which will meet the coal handling requirements of your plant.

Whether you require a complete coal handling system or merely a bunker spout—your need can be met from the comprehensive line of G-W Coal Handling Equipment.

At your service at each of the offices below are practical engineers who thoroughly understand coal handling in all its phases. If you contemplate the installation of coal handling equipment; desire to determine, by means of a complete survey, the most economical method of handling your coal; or merely wish to talk over your coal handling problem—you will find the full cooperation and helpful advice of these long-experienced men decidedly worth while. Call them in at any time without feeling under the slightest obligation.

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COAL HANDLING EQUIPMENT

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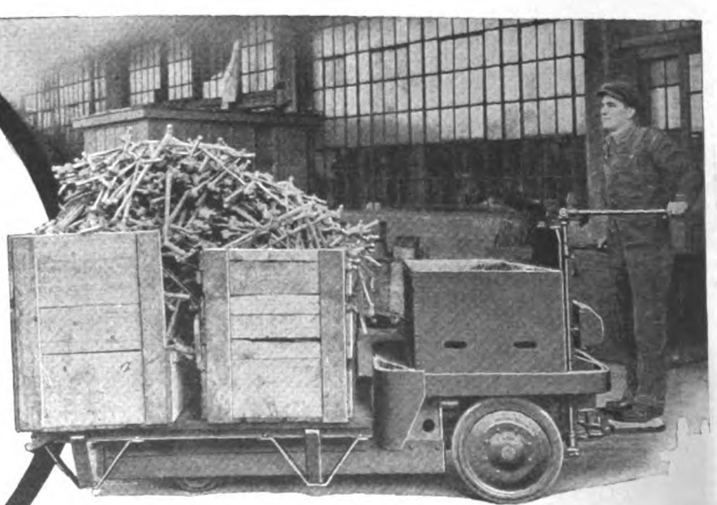
Long Life
and Trouble-Free Service

THE vitality of an industrial tractor or truck centers in its motor.

All Baker machines are equipped with a Baker-built motor designed wholly and solely for its specific work, which will operate at higher overload over a greater period of time than any other industrial vehicle motor equipment.

Bulletin 26, covering all types of Baker material handling tractors, trucks and cranes, is sent promptly on request.

THE BAKER R & L COMPANY
Cleveland, Ohio



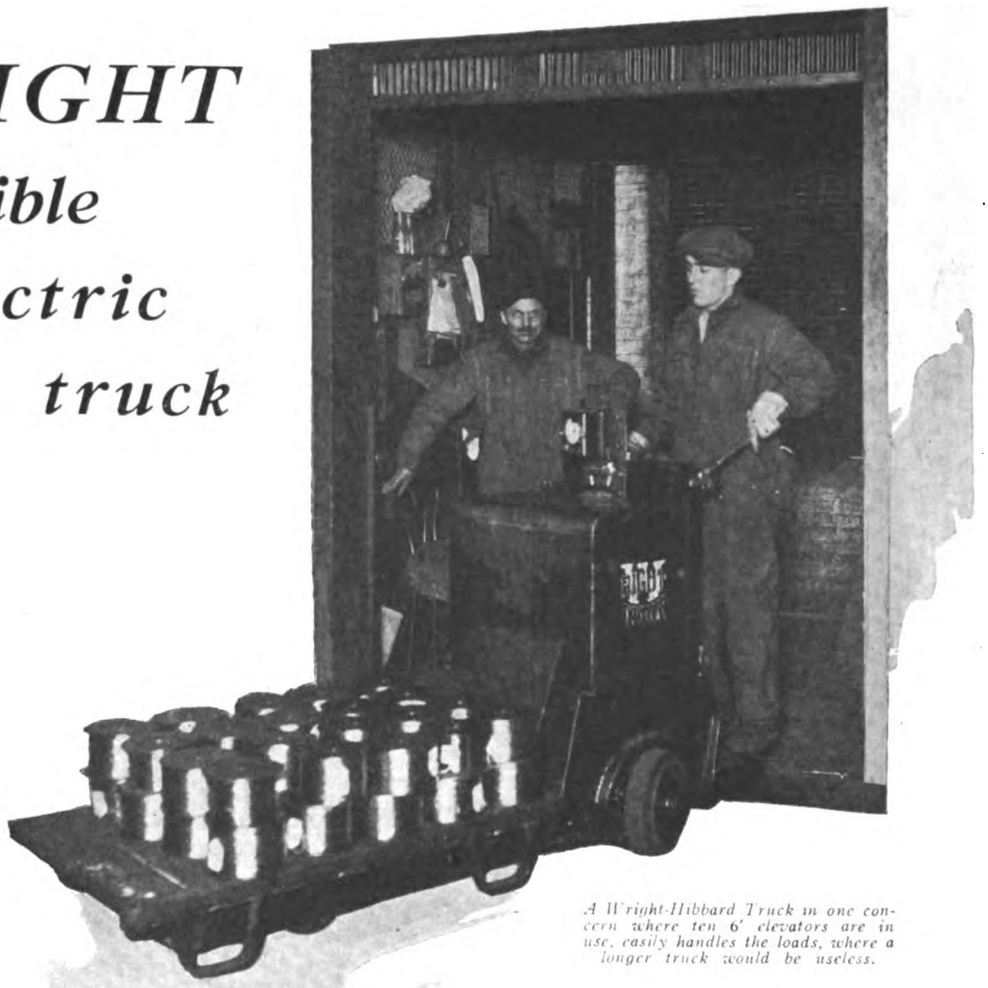
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TRADE-MARK REG.U.S.PAT.OFF.

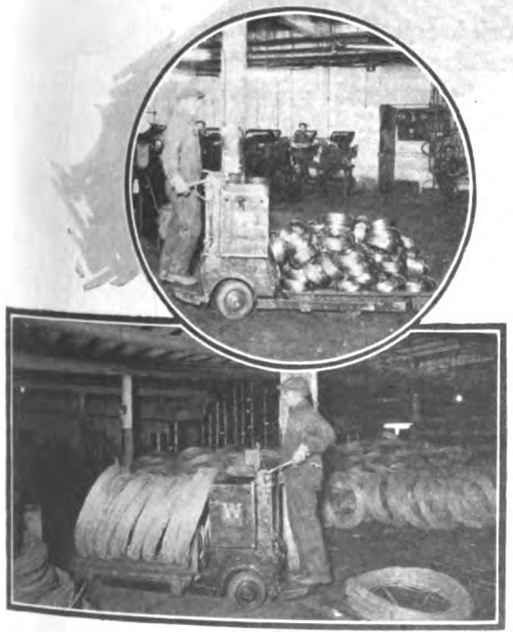
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The WRIGHT Is a flexible electric truck



A Wright-Hibbard Truck in one concern where ten 6' elevators are in use, easily handles the loads, where a longer truck would be useless.



SEEMS odd to say an electric truck is "flexible," doesn't it? We mean, of course, that its extremely short turning radius—3¾ ft.—the rapidity with which the platform is raised, its high clearance, and its other features, make the Wright Industrial Electric Truck the easiest handling truck on the market.

Outside of strength and long life, ease of handling is everything in a truck. When the operator knows that the truck responds to the slightest touch, and can go anywhere a hand truck goes, he will see that it does a full day's work and earns dividends for you.

Wright Trucks are made in thirteen different sizes to meet any industrial need. There is a size for you.

Send for our bulletins.

WRIGHT TRUCK

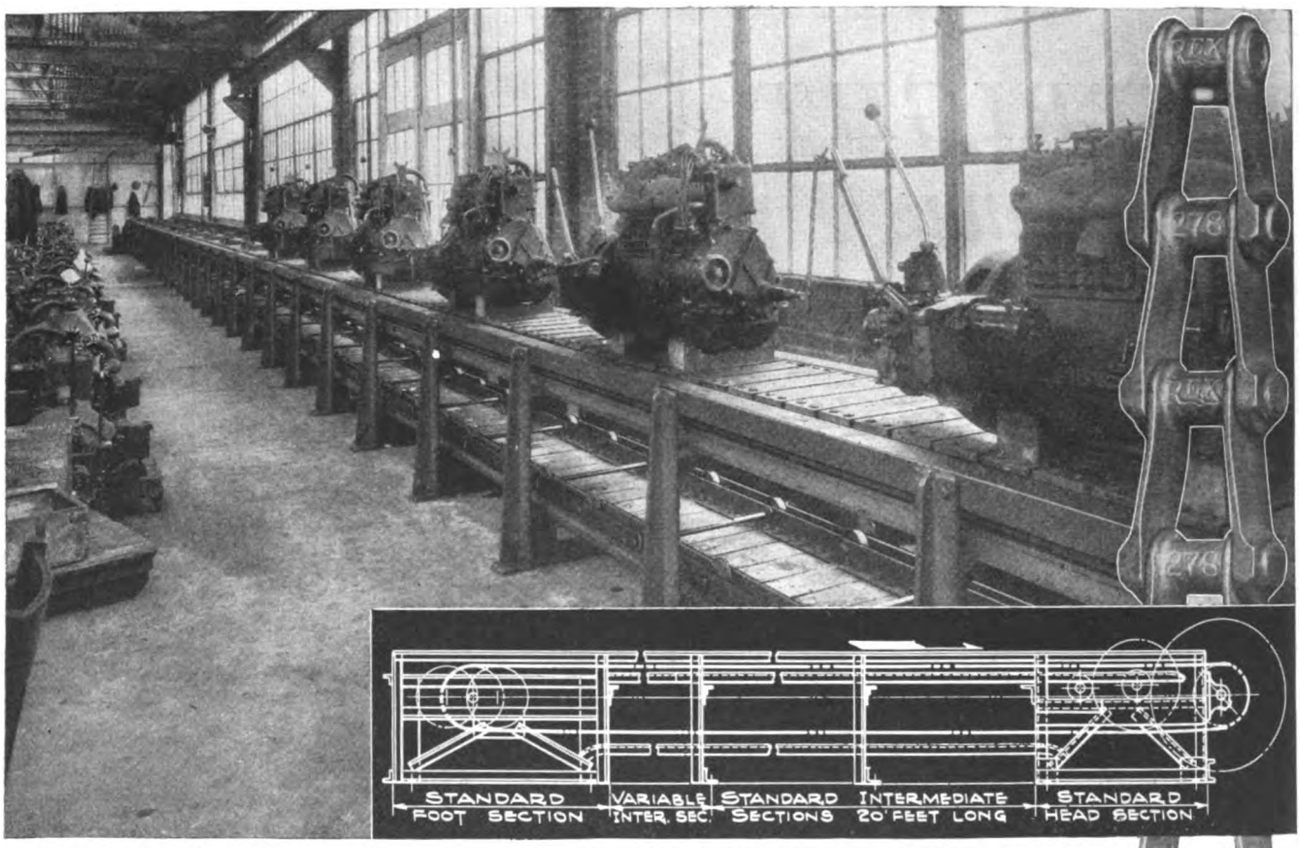
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INDUSTRIAL ELECTRIC TRUCK CO.

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Typical Rex Apron Conveyor

Showing how Rex Q. D. Conveyors are flexibly standardized

Another Slow Delivery Date Bites the Dust

This time it is the delivery date on Apron Conveyors. This company is now prepared to ship a Rex Q. D. Conveyor, any width, any length, in 50% of the time that was heretofore considered necessary for delivery for this sort of equipment. Rex Q. D. Apron Conveyors are not standard machinery. Each one is designed for a particular job, but the engineering necessary to produce them has been standardized.

The time consuming engineering details of Rex Q. D. Apron Conveyors, have been reduced to standards. It is only necessary to apply the expert engineering judgment on the details that fit the conveyor to the special needs of the customer. The work can be put in the shop for production within a day or two, or at most very few days after receipt of your order.

In the shop the work is equally advanced. Standard head and foot sections, intermediate sections and structural steel supports are partially completed.

That is why we are able to offer this unusual delivery date on Rex Q. D. Apron Conveyors. On the nominal sizes the delivery date will be even less than 50% of the time ordinarily required. On all sizes it will be only a fraction of the time ordinarily required for the delivery of such machinery.

Rex Q. D. Conveyors are identical in design and materials with the many Rex Conveyors that are earning money for their users today in transporting materials, progressive assemblies, etc.

If you need an Apron Conveyor write today.



REX Q. D. CONVEYORS

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CHAIN BELT COMPANY

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From Maine to California

Satisfied Hyatt Lineshaft Bearing Users Are Legion

FROM the Avon Spinning Company, Lewiston, Maine, to the Diamond Match Company, Chico, California, the users and steadfast friends of Hyatt lineshaft bearings are numbered by the thousands.

At Baltimore, Maryland, the American Hammered Piston Ring Company equipped their plant throughout with Hyatt lineshaft bearings in 1917. Today Mr. S. H. Weeks, Maintenance Engineer, reports:

> "A 2 7/16" Hyatt bearing ran twenty-four hours a day for 6 years in atmosphere filled with iron filings and dust. A micrometer test then showed no shaft wear whatever. Our plant is standardized on Hyatt lineshaft bearings."

From Atlanta, Georgia, come words of appreciation, voiced by the treasurer of the Atlanta Paper Company:

> "In 1897 Hyatt roller bearings were installed on our main shaft. The shaft now shows no visible evidence of wear and is not scored. We have saved at least 50% on our oil bills. The friction load was reduced 50% to 60%. During their 20 years of steady use we have never had a hot box, never used an ounce of babbitt, never spent a single dollar for bearing repairs or replacement."

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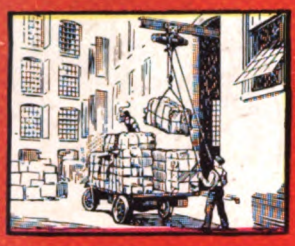
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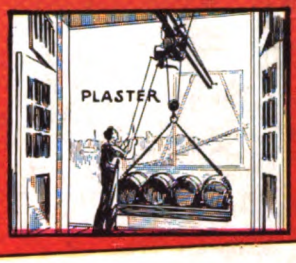
[*Write for Bulletin 130.* It contains information of interest on power transmission and a list of Hyatt bearing users.]

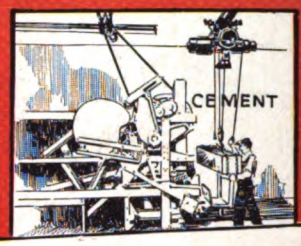
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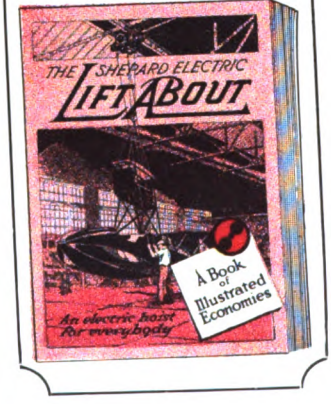
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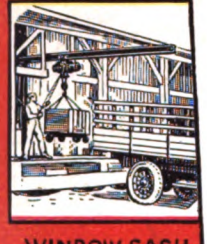
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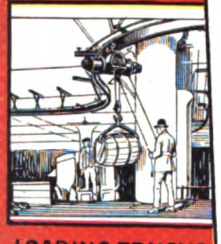



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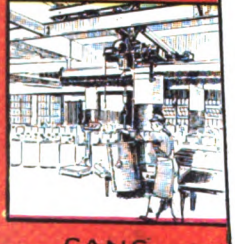

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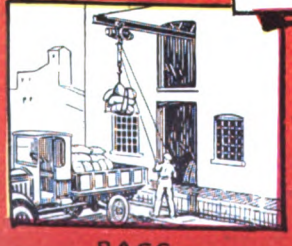

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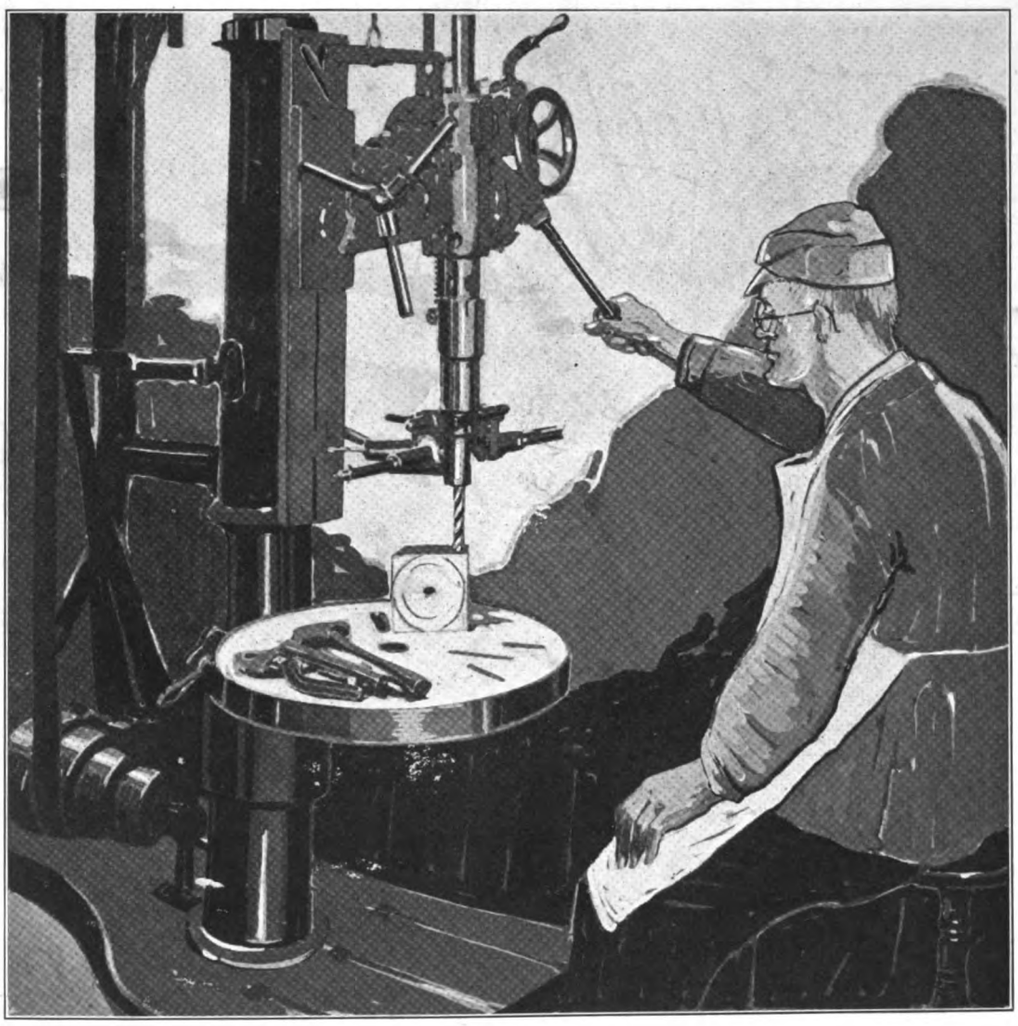
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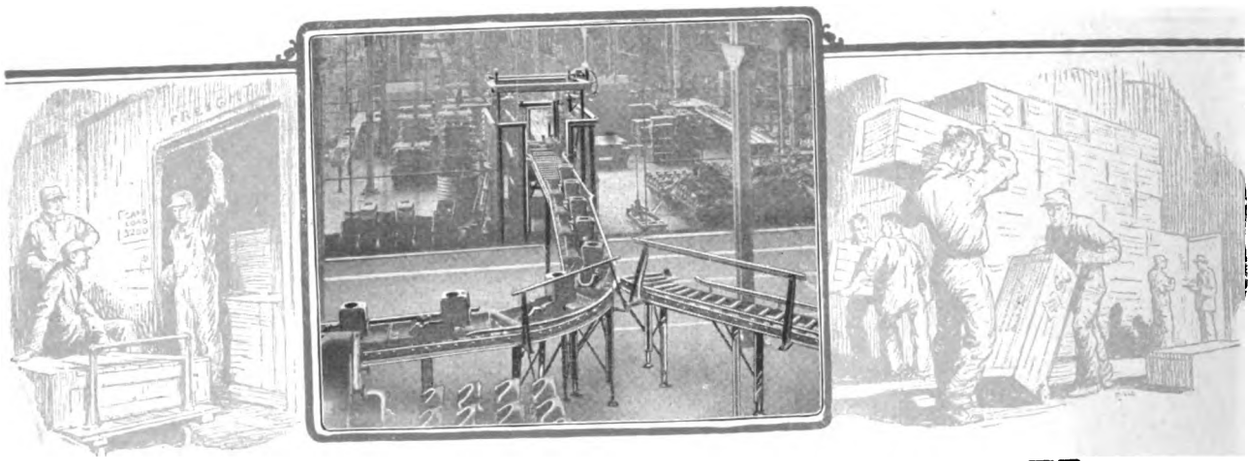
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Fairbanks-Morse Keeps Ahead of the Crowd-

IN common with other progressive industries Fairbanks-Morse, Beloit, Wisconsin, realizes the value and necessity of constantly seeking and applying methods that will keep down their material handling, incidentally their production costs.

The illustration above shows a part of their Standard System handling by gravity, cylinder blocks for stationary gasoline engines

Hardworking, conscientious workmen, no matter how willing, cannot accomplish the same results that these non-tiring, non-salaried conveyors do.

The company that is going to keep ahead of the industrial crowd must now more than ever give thought to keeping down production costs. For the cost of production regulates the selling price, and the handicap of a high selling price needs no explanation.

Catalog S-6 will likely be of interest to you in more ways than one. Ask us for it.

BUILT TO FIT YOUR NEEDS

Whether the material handling equipment you plan on using will consist of a small unit or a large system—we would like to have the privilege of helping you obtain something practical and satisfactory.

Call on us for engineering help. Trained men from this company will be glad to consult and plan with you.

There will be no obligation attached to your making use of this permanent offer.

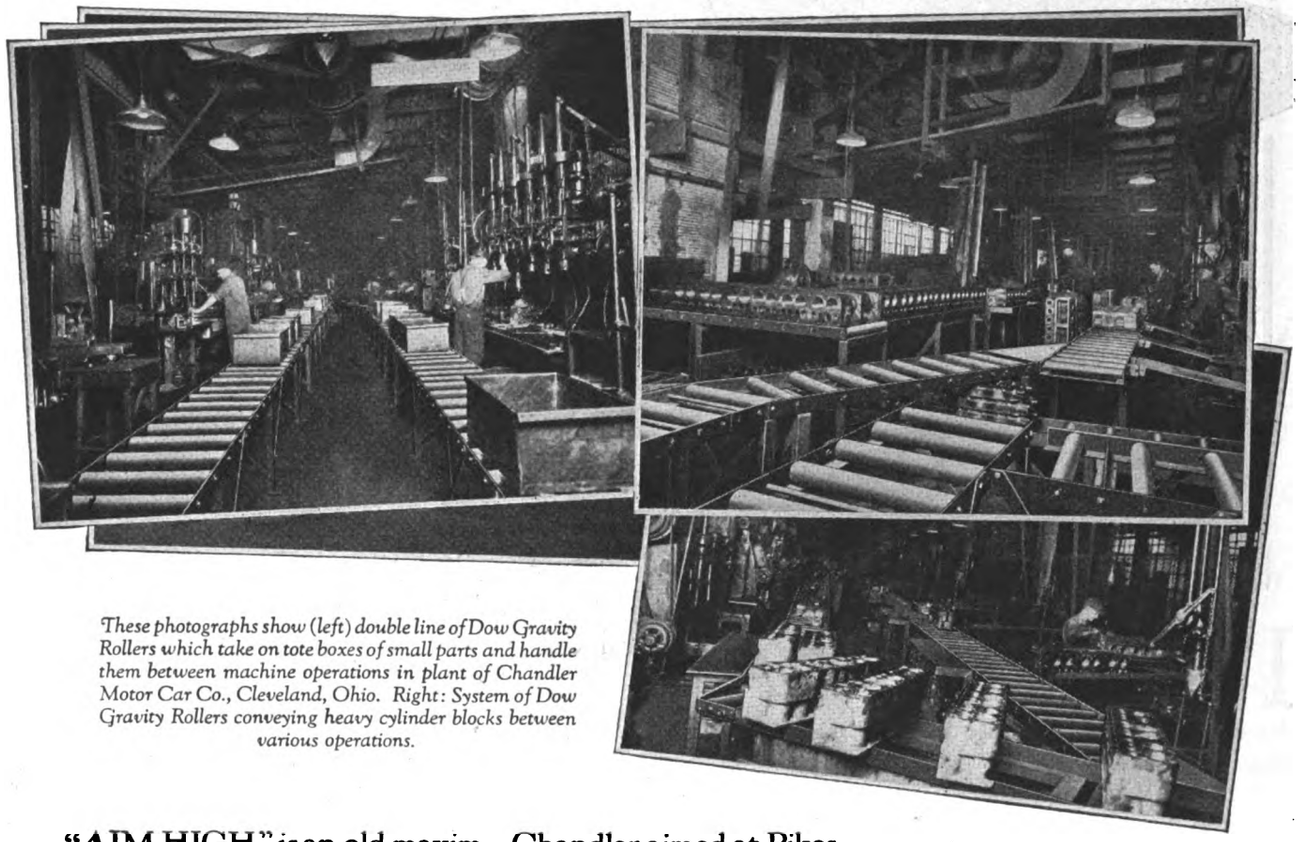
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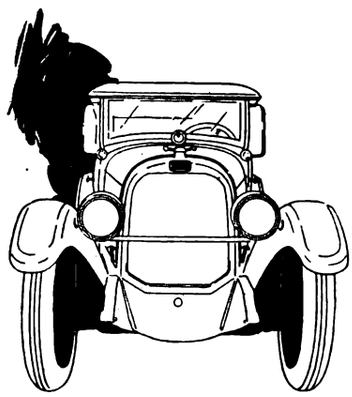
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CHANDLER—another user



These photographs show (left) double line of Dow Gravity Rollers which take on tote boxes of small parts and handle them between machine operations in plant of Chandler Motor Car Co., Cleveland, Ohio. Right: System of Dow Gravity Rollers conveying heavy cylinder blocks between various operations.

"AIM HIGH" is an old maxim. Chandler aimed at Pikes Peak when he built his motor—and he hit the mark. Today the performance of the Chandler is accepted by users as the embodiment of efficiency and economy. Still the Chandler is a medium-priced car. There is just one way to make a quality product to sell at a minimum price and that is to systematize production so that costs are kept to the lowest consistent level. Chandler is doing it. Dow Conveyors are helping. And Dow Conveyors can help *you* do the same thing. Ask our nearest office.



In addition to its well known Pikes Peak Motor, Chandler is noted for its clashless Traffic Transmission, designed to facilitate the control of the car in trying traffic conditions—an accomplishment rather striking in its similarity to the success of Dow Conveyors in simplifying "traffic" methods inside the factory itself.

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Industry Illustrated

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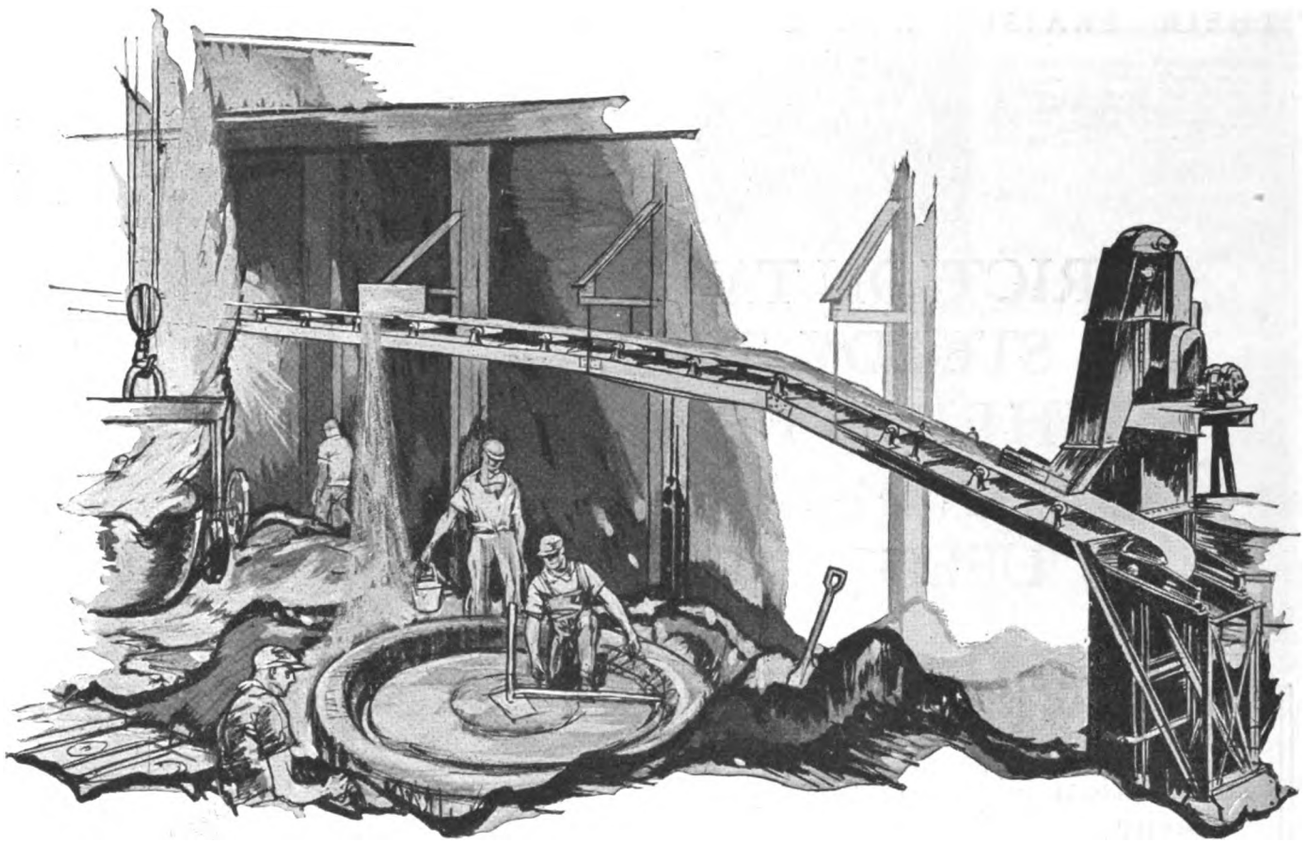
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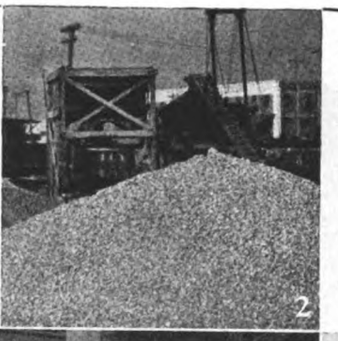
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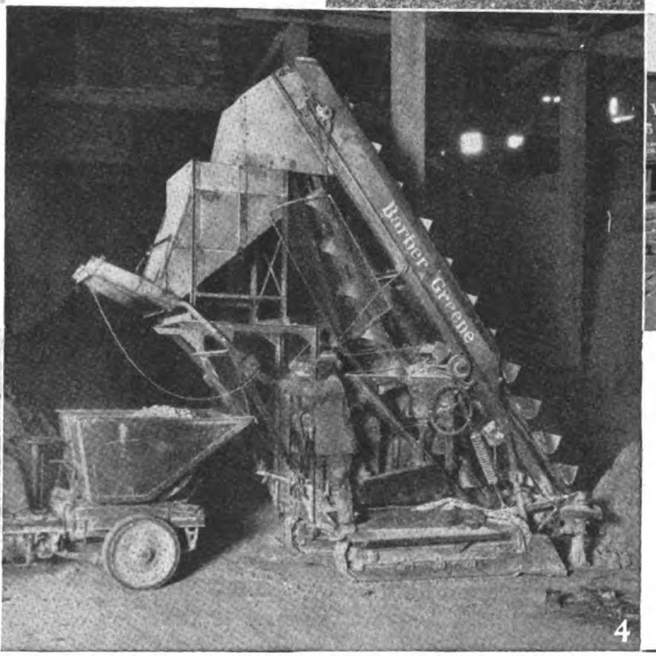
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3.—*A Barber-Greene type "N" Conveyor unloading bone from beneath a hopper-bottomed car for the Pacific Bone, Coal and Fertilizer Company.*







4.—*The Barber-Greene Bucket Loader that sent twelve wheelbarrows into the junk pile for the Newark Plaster Company.*

5.—*A Barber-Greene type "N" unloading cars from a specially constructed track hopper.*

And Twelve Wheelbarrows Went Into the Junk Pile

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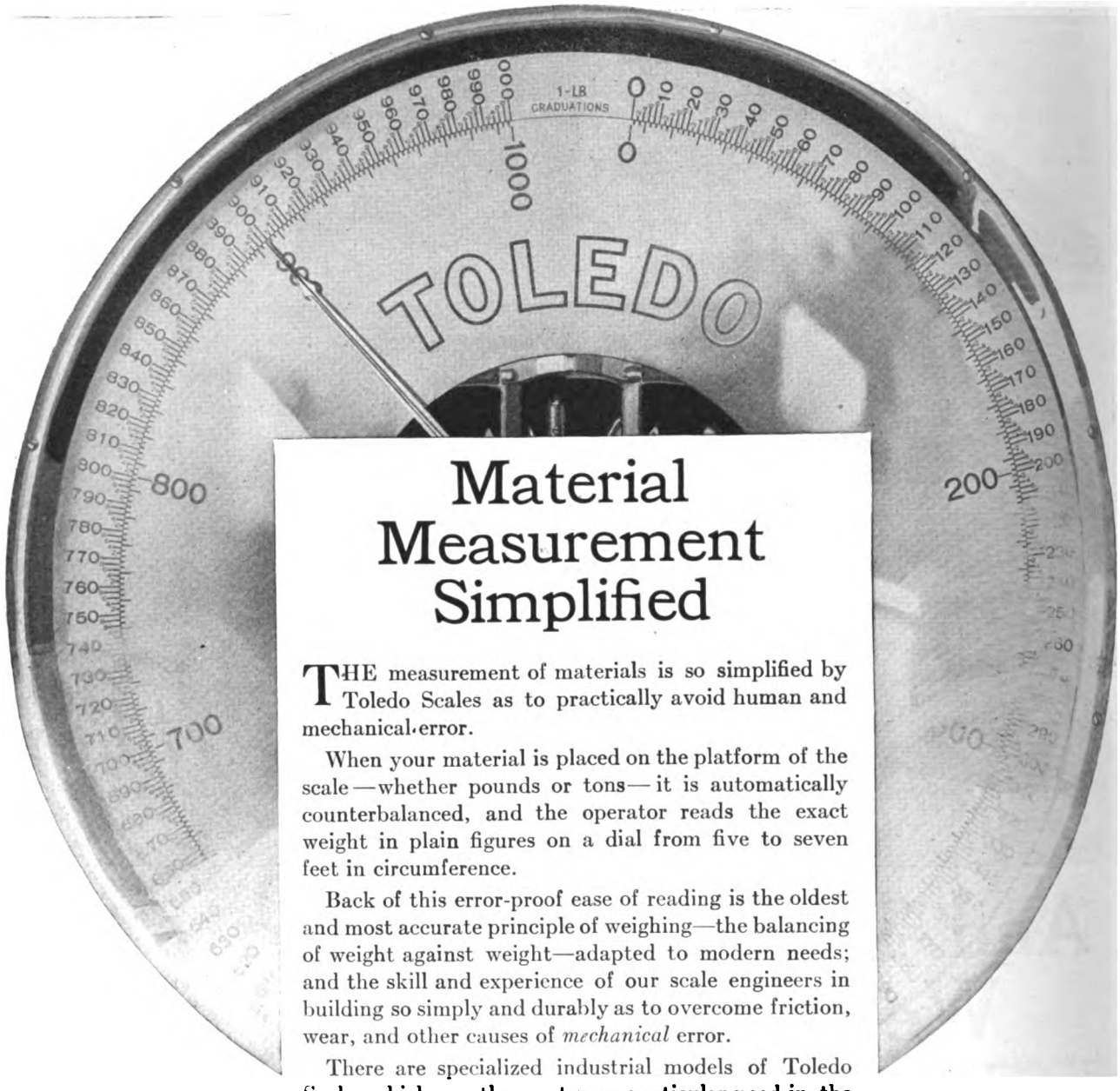
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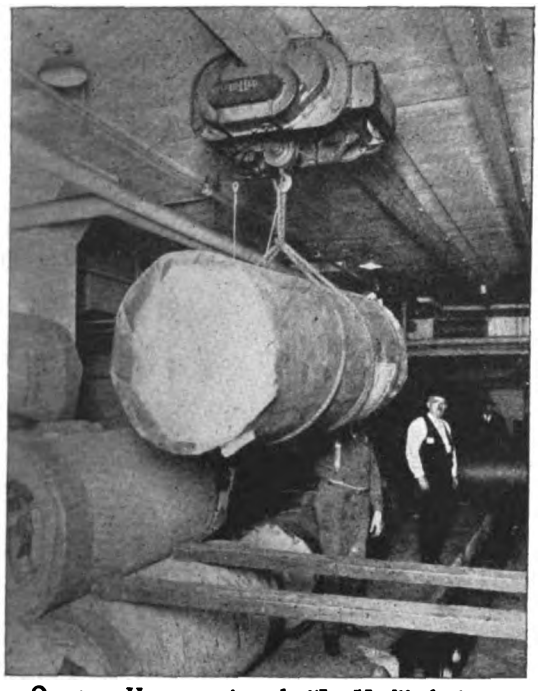
Toledo Scales are used for automatic weighing, computing, counting, mailing, checking, packing, shipping and special purposes in stores, offices, shipping rooms, factories, mills and warehouses. Scales to weigh everything from an ounce of spice to thirty tons of steel.

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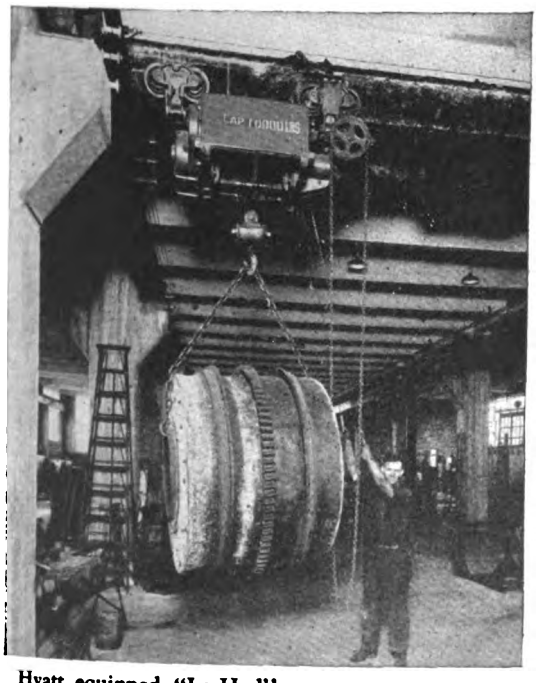
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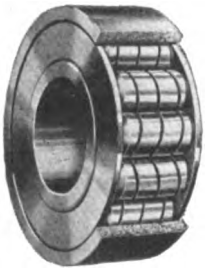
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One ton, Hyatt equipped "Lo-Hed" hoist, manufactured by the American Engineering Co., Philadelphia, Pa. This hoist handles the heavy rolls of paper at the plant of the New York Herald-Tribune, New York City. Hyatt bearings insure easy and rapid transfer of materials.



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with hoists— Hyatt equipped

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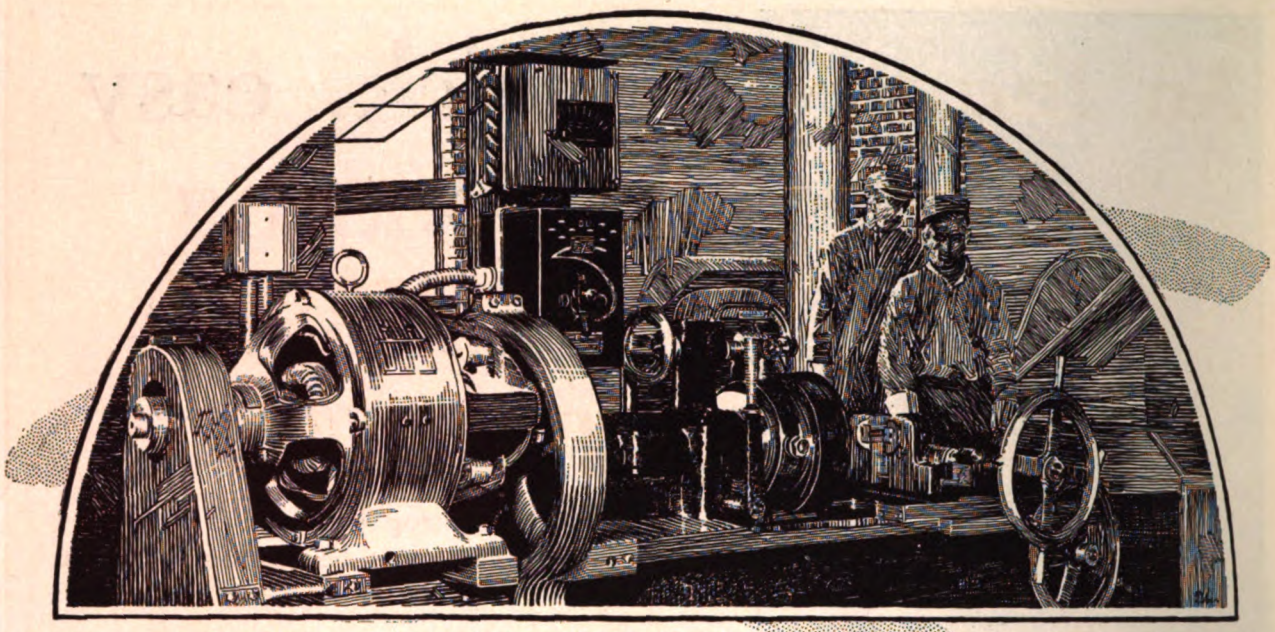
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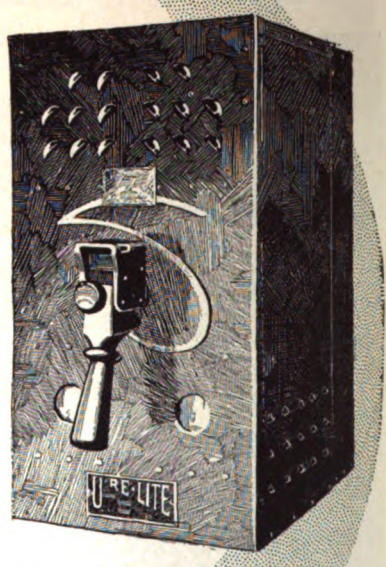
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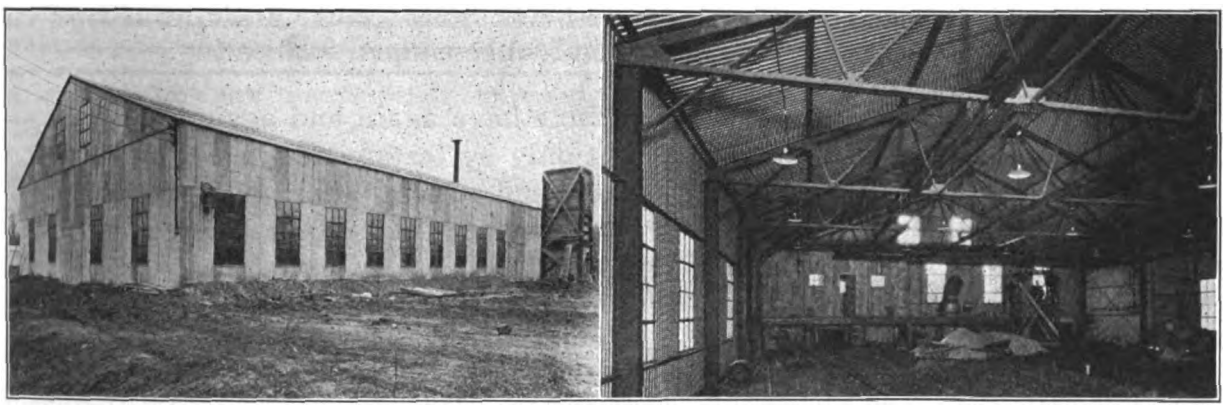
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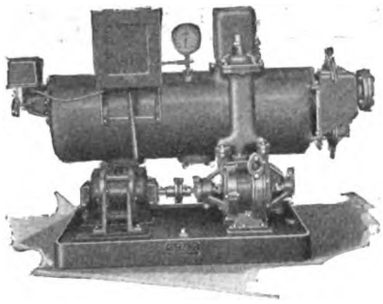
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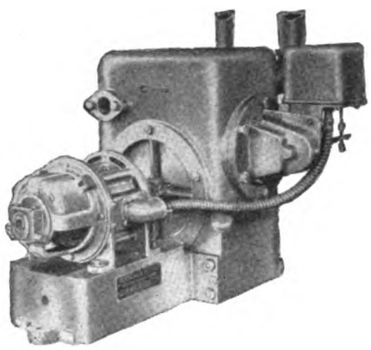
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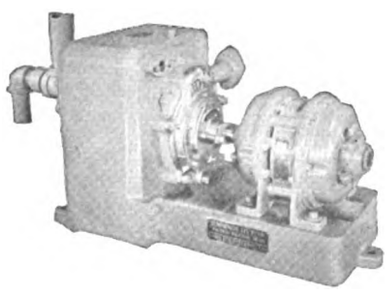
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"NEVER be satisfied with success," is a splendid motto for every industrial concern and for every ambitious man in industry. It is a good motto too for the editors and publishers of publications such as this, who believe in practicing what they preach.

Phenomenal growth in the number of readers and the volume of advertising, such as have marked the career of INDUSTRY ILLUSTRATED, should not and must not distract us from the establishment of progressive standards of service. In fact, such recognition demands renewed and redoubled efforts on our part to justify the faith which has so splendidly and unreservedly been placed in us.

This issue, therefore, marks the initiation of a new and better service to the readers of INDUSTRY ILLUSTRATED, who are the busy, ambitious and progressive practical readers in every branch of industry—the superintendents, plant managers, department heads and key men who keep our wheels turning and our industrial fires burning brightly.

These men appreciate the pictorial presentation of modern industrial equipment. They gain at a glance, from our carefully selected illustrations, ideas which they may profitably apply in their own work. These men appreciate the time-saving feature in pictorial presentation. Therefore, we are increasing the pictorial strength and number of illustrations in our new editorial make-up.

These busy men who make industry move are found in a wide variety of industrial plants. Therefore, to better serve them we are greatly increasing the number of topics covered in every issue. Our new make-up helps us to do this, and in addition we are carefully studying the art of "condensation," of boiling down our subjects into the fewest possible words with the aid of more pictures.

These busy men of industry make their own personal progress and the success of their organizations through the proper selection and use of modern profit-making machinery. They must keep close tabs not only on the better ways to use existing equipment, but also on the new products put out by the makers of improved machinery. To aid them in these purposes we are initiating a directory of information which will guide them in procuring valuable practical information on the effective operation of existing equipment, and we are also presenting from month to month, largely in pictures, the new equipment and tools of industry.

These and other new services and features, begun in this issue, we will endeavor continuously to enlarge and perfect so that INDUSTRY ILLUSTRATED may fittingly respond to the inspiring confidence placed in it by the men it serves.

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Our Newest Floating

The Navy's New Aircraft Carrier,

By B. S.

THE "Saratoga" is the first of two new aircraft carriers under construction by the navy department. It is a mighty ship, excelling in propulsion power, speed and length the greatest of the present electrically driven fighting vessels such as the "Maryland," "West Virginia" and "California."

Originally, this vessel, also the U. S. S. "Lexington" to be launched this Fall at Quincy, Mass., was to have been a battle cruiser. The modification of the United States naval program, however, due to the decisions reached at the Conference on the Limitation of Armament, led to the conversion of the two ships into aircraft carriers.

The "Saratoga" will be a combined floating airplane field, hangar and workshop for the accommodation of 72 fighting airplanes and bombers. The vessel will be completely electrified, and in order to supply sufficient power for propulsion and auxiliary purposes, it will be equipped with a generating plant capable of developing 180,000 horsepower for propulsion purposes alone. For purposes of comparison, it may be stated that this power is greater than the combined rated output of the six electrically driven capital ships now in commission, the "New Mexico," "California," "Tennessee," "Maryland," "Colorado," and "West Virginia."

The "Saratoga" will be completely electrified, thus continuing the policy of electrification adopted in the building of the "New Mexico." The principal use to be made of electricity is naturally the propulsion of the ship, and the apparatus designed for this purpose consists of four 35,200-kilowatt turbine-generators supplying current to eight 22,500-horsepower motors. The turbines will be driven by steam from 16 oil-fired boilers.

When the ship was launched the motors were the only part of the electrical equipment then installed. They are connected in pairs to each of the four propeller shafts. Thus the energy delivered to each shaft by its motors will be 45,000 horsepower, or a total for all four shafts of 180,000 horsepower.

The total weight of the propulsion apparatus will be 2,200 tons. Each generating set will be about 40 feet in length and each pair of motors has a length of about 34 feet. In the words of Rear Admiral Griffin, former chief of the Bureau of Engineering, the "Saratoga" will represent "The greatest horsepower per shaft that has ever been projected in any marine installation, irrespective of the type of motive power."

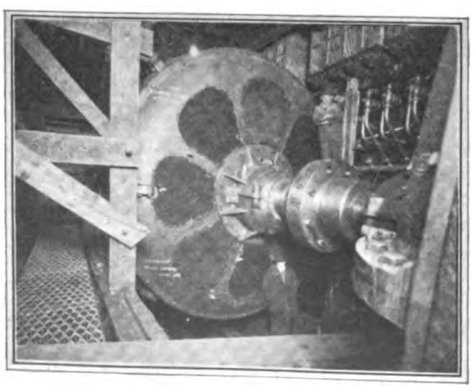


Fig. 2. One of the 22,500 hp. electric motors used in the propulsion of the "Saratoga." There are eight of these motors, two to each propellor, giving a 34 knot (40 miles an hour) speed to the vessel.

In addition to the propulsion machinery, the "Saratoga" will be equipped with six 750-kilowatt, direct current, auxiliary turbine-generators. These will furnish direct current for all electrical purposes except main propulsion, including the operation of steering gear, anchor windlasses, ventilation fans and lighting system.

Particular attention will be paid to the installation of suitable radio equipment on the "Saratoga." Complete equipment will be installed, when the boat is finally in service, for sending and receiving radio messages. The antenna will not be constructed in the usual manner, but will be run to the deck from a single topmast, which must be lowered when the vessel passes under the Brooklyn Bridge.

Interior arrangements will also be out of the ordinary. The operations to be carried on below decks, in accordance with the function of the ship, will be unique and airplanes in large numbers will be accommodated. There will be ample space for storing flying machines, as well as elevators and cranes for hoisting them to and lowering them from the deck where they will land or "take off."

This electrification follows a development covering a period of nearly 20 years. The first application of electricity for marine purposes was in 1907, when the principle was adapted to fire boats for the city of Chicago. Since that time, electric propulsion has been applied to every class of ship except large passenger liners.

The first naval vessel in the world to be equipped with turbine-electric drive was the U. S. S. "Jupiter," a collier launched in 1912. This was later converted into an aircraft carrier, when it



Fig. 1. The flying deck of airplane carrier "Saratoga" 105 ft. wide and 888 ft. l constituting the world's la

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Electrical Marvel

U. S. S. "Saratoga"

Havens

was renamed the "Langley." The U. S. S. "New Mexico," first battleship of any nation to be equipped with turbine-electric drive, was launched in 1917, and the U. S. S. "Tampa," first turbine-electric coast guard cutter, was launched in 1921. All these vessels were electrically equipped by the General Electric Company.

It is interesting, in this connection, to note that the "Saratoga" is the fifth vessel of the United States Navy to bear that name. The first was a sloop of war of 18 guns authorized by the Continental Congress in 1776 and 1777.

The second "Saratoga" was a ship of 26 guns, 734 tons, launched in 1814. A 22-gun sloop of war was the third "Saratoga."

The fourth "Saratoga" was originally the armored cruiser "New York," launched in 1891. This was an 8,150-ton vessel. The name was changed, in 1911, from "New York" to "Saratoga," and, in 1917, from "Saratoga" to "Rochester." It is now a second line cruiser.



...plane field. The ship ...72 planes, two eleva... provided to bring ...from below decks.



Fig. 3. The launching, on April 7, at Camden, N. J. The ceremonies were broadcast by radio from stations WJZ, New York; WGY, Schenectady; and WRC, Washington.

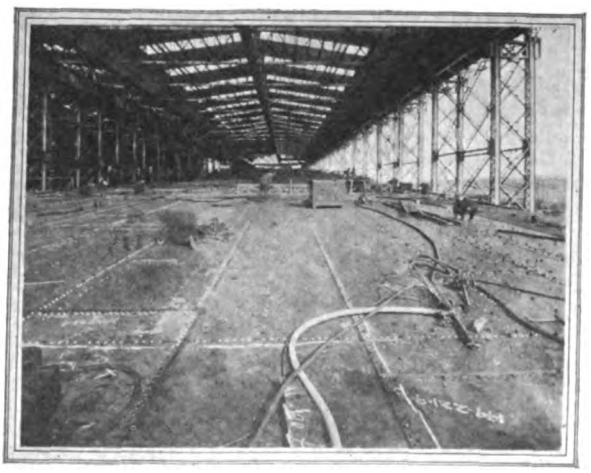


Fig. 4. At the left—here an idea may be gained of the size of this floating flying field.

Fig. 5. The ship is a floating electrical marvel, being electrically propelled and controlled. Its equipment would be enough to furnish all the light, heat and power for a city as large as Boston.



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Edward Wotton, Supt. of Equipment, Chicago Motor Coach Co., Chicago, says: "Large door openings are necessary in our garages to provide safety clearance for motor coaches. Our large West Side garage has two 40 ft. by 17 ft. openings. Door hangers for openings this size must be of proper design and construction or the great weight of the doors will soon put them out of commission.

"After experience with many other types of hangers, we have standardized on Richards-Wilcox Equipment, using ball-bearing trolleys of sufficient capacity to avoid overloading, because its absolute rigidity prevents misalignment and excessive wear.

"One 40 ft. by 17 ft. opening was equipped with a pair of sliding doors, weighing 4,500 lbs. each. These doors must be operated hundreds of times each day, as our buses are constantly leaving or returning.

"The other opening was fitted with 4-fold doors running on R-W No. 925 trolleys. Each door weighs 2,300 lbs.—or a total weight of 9,200 lbs.; yet with the R-W equipment these doors can be easily handled by one man.

"The old type of door was so hard to operate it often was not opened wide enough, and accidents resulted, after which the doors never would operate properly. Our R-W equipped doors are most satisfactory."

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The Art of the Automatic Fireman

I—An Industrial Technique that Cuts Power Costs in Half

By Francis Juraschek

THE problem of how to burn coal more effectively is at last gaining the attention of the industrial executive. For many years he has made every effort to cut production costs to the bone in thousands of places throughout the manufacturing plant, and the tale of our automatic and semi-automatic machines is the wonder of the world. But the power plant has been a necessary evil, a department of the business which did not produce goods that could be sold and on which profits could be made directly.

To the everlasting credit of the industrial executive at large be it said today, however, that he is beginning to see the relation of the power plant to his production costs, and to understand the fact that lowering the cost of making steam yields profits as surely as cutting the costs of production operations.

And the start is being made at the right place—where the fuel is burned.

Manual firing of boiler furnaces, under the best of conditions, is wasteful as compared with automatic stoking. This is as true as any comparison between manual and mechanical production operations. And the main reasons why mechanical stokers perform seemingly wonderful things, are simply that they avoid the peculiar errors to which all hand-firing is subject. Stokers save coal by burning it more scientifically and completely than it can be burned in a hand-fired furnace. Further, because of this fact, they burn coal of such poor quality (and consequently low price) that it cannot be burned at all in the hand-fired furnace. Moreover, mechanical stokers are not limited to the burning of any one grade or class of coal; consequently a stoker-fired plant is enabled to burn *any* coal available in times of coal shortage.

Stokers save labor in the boiler room, because their operation is practically automatic. A minimum number of attendants are required to see that the stokers are adjusted from time to time to meet the varying load conditions. Brawn is not needed any more, for the stokers take the place of muscular effort.

Stokers save both fuel and equipment by operating at ratings not possible with hand-firing; thus eliminating the necessity for carrying banked boilers ready for peak load calls.

And finally, stokers eliminate the smoke nuisance which is almost unavoidable with most hand-firing; thus saving fuel again, because smoke is merely the evidence of incomplete combustion.

The art of the automatic fireman has been called into play of late years in so many different kinds of plants and under such widely varying conditions that its range of application may be said to be universal. Naturally, such a wide range of application together with the varying qualities of the fuels encountered in different localities, has made necessary the development of many different kinds of stokers.

The kinds of stokers which have found successful

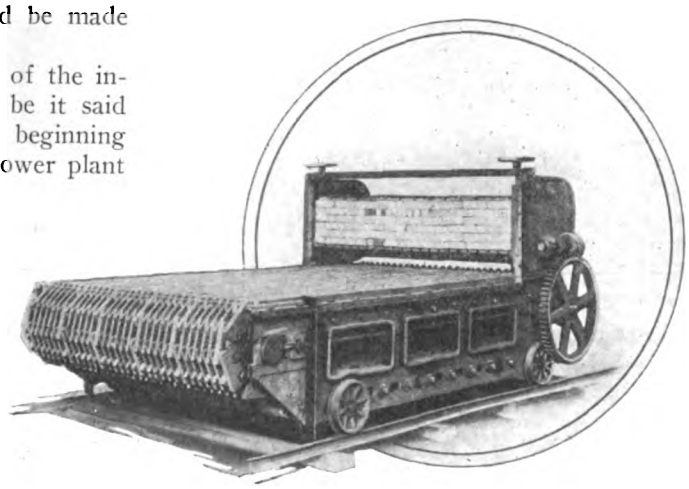


Fig. 1. The Westinghouse Chain Grate Stoker is of the natural draft type. The grate bars are the links which form the endless belt on which the fuel bed is carried.

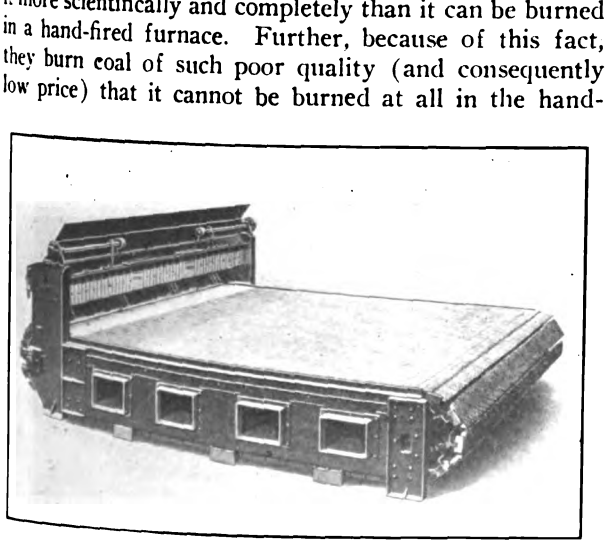


Fig. 2. The grate bars in the Harrington Chain Grate Stoker are not links of the endless belt, but are supported independently on racks carried by the chain. The grate bars interlock when traveling flat through the furnace.

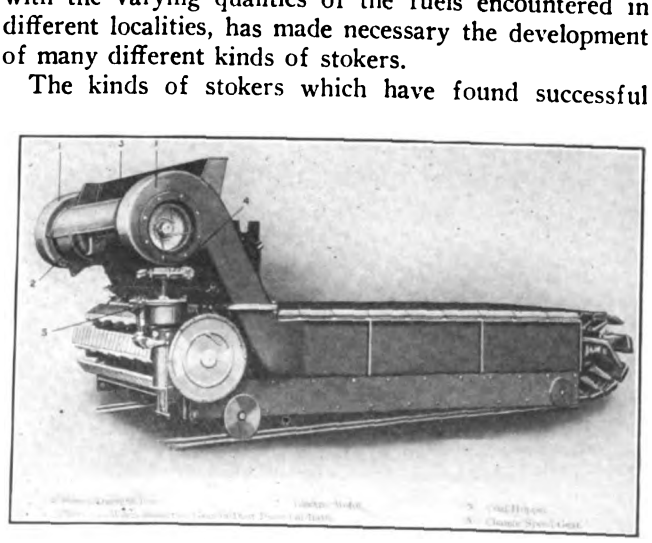
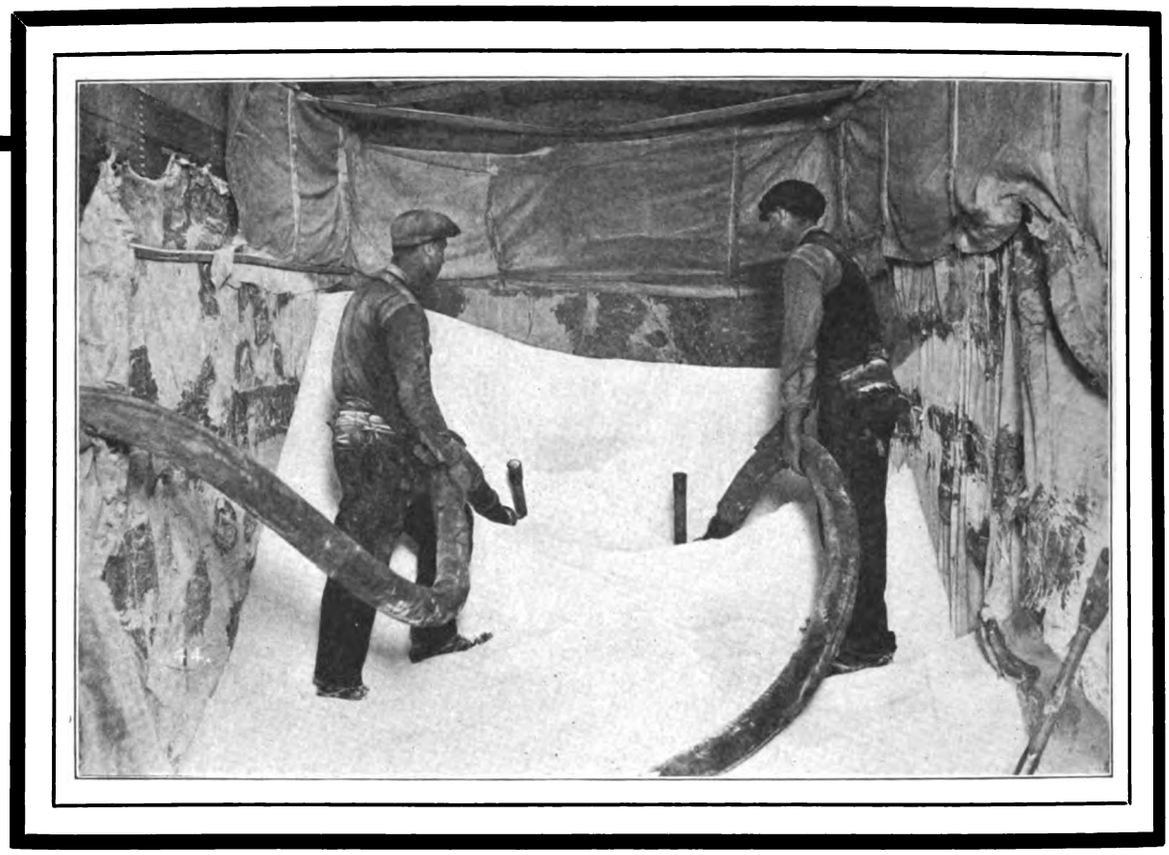


Fig. 3. The Self-Contained Chain Grate Stoker, is, as its name implies, a stoker unit containing every element essential to efficient operation, integrally mounted.

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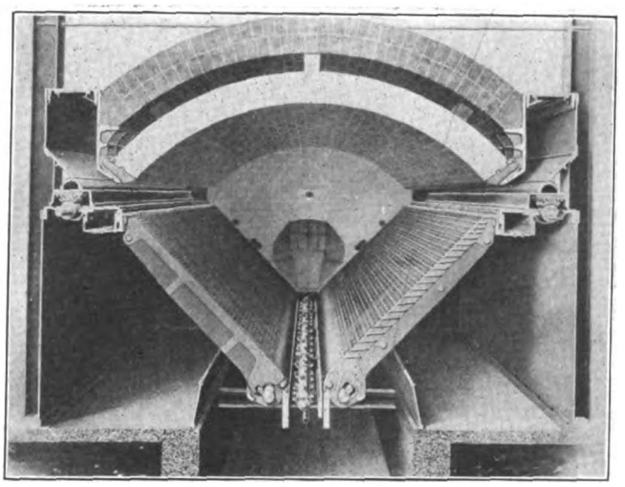


Fig. 4. The Murphy Automatic Furnace is typical of the V-type inclined side feed stokers. The coal magazines are located along each side of the stoker, above the grates, which are completely arched over.

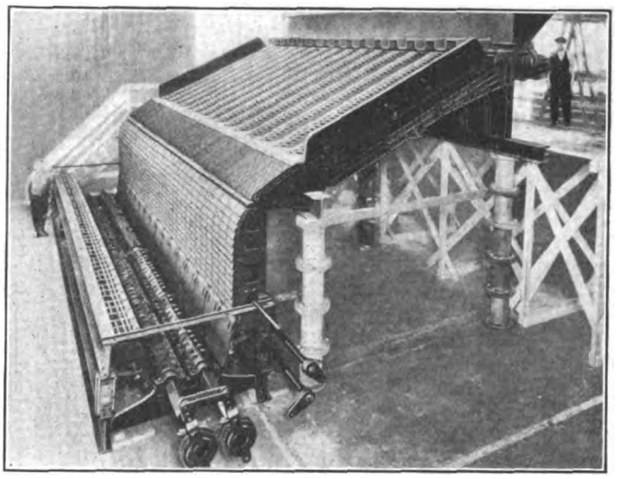


Fig. 5. The Taylor Stoker shown here is one of the largest underfeed stokers made. It is 15 retorts wide by 37 tuyeres deep, with extension grates, and double clinker rolls in a deep ash-cooling chamber.

application in this country may be generally divided into three types, according to the manner in which the coal is fed to the fire, and two of these types are made in two broad classifications, according to the manner of feeding air to the fire.

The three types are

1. The traveling chain grate stoker.
2. The overfeed stoker.
3. The underfeed stoker.

Both chain grate stokers and underfeed stokers are built in natural draft and forced draft types, while overfeed stokers are in practice limited to natural draft.

The principal makes of stokers are these:

Chain Grate

Babcock & Wilcox
Brady
Continental
Coxe
Green
Harrington
Illinois
LaClede
McKenzie
Playford

Detroit
Lehigh
Model
Murphy

Jones

Self-contained
Westinghouse

Overfeed

Roney
Wetzel
Wilkinson

Underfeed

McClave-Brooks
Moloch
Roach
Riley
Taylor
Type E
United
Westinghouse

To which may be added a short list of hand-operated stokers all of the overfeed type:

Auburn
Cokal
Huber
Gibby
McClave-Brooks
National
Marion
Vogt

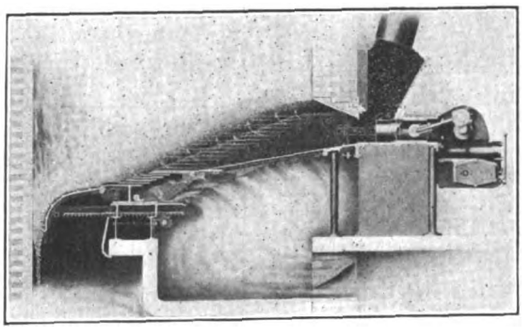


Fig. 6. This view of the Riley Stoker shows even more clearly the paths of the air and coal in the underfeed section proper, and the separate air control for the extension grates.

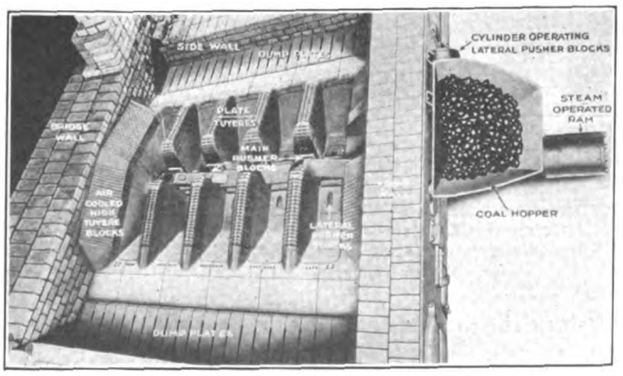


Fig. 7. The Lateral Retort is a horizontal type underfeed stoker with side ash discharge. This is particularly adapted to locations where basement space is not available for ash pits.

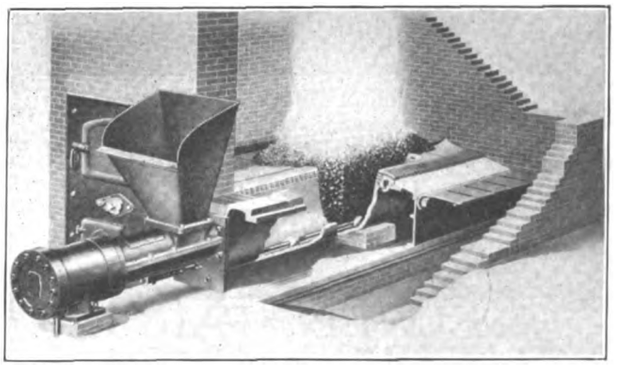
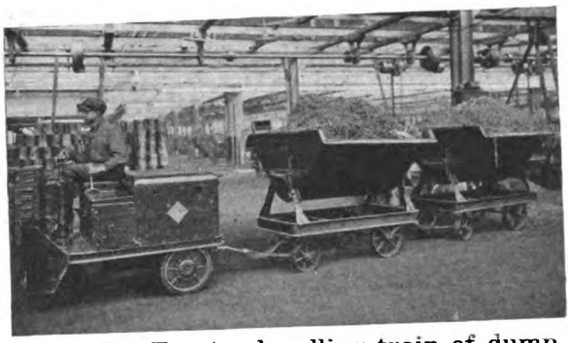


Fig. 8. The Jones Side Dump Stoker is a single retort underfeed stoker with side ash discharge, of rather smaller capacity than the Lateral Retort.

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Three Elwell-Parker Methods for Handling Chips and Refuse



Type TA Tructor handling train of dump cars loaded with chips. Used on level or elevated runway. 6 years in service.



Type ID flat-top general utility Tructor showing method of lift by means of elevator to overhead runway — dumping from there into car. 8 years in service.



Type EG Tructor picks up bodies filled with chips or refuse right in shop. Pictured in use on an elevated runway, dumping directly into cars. 4 years in service.

Request Bulletin Number 35

The ELWELL-PARKER ELECTRIC COMPANY

Cleveland Ohio

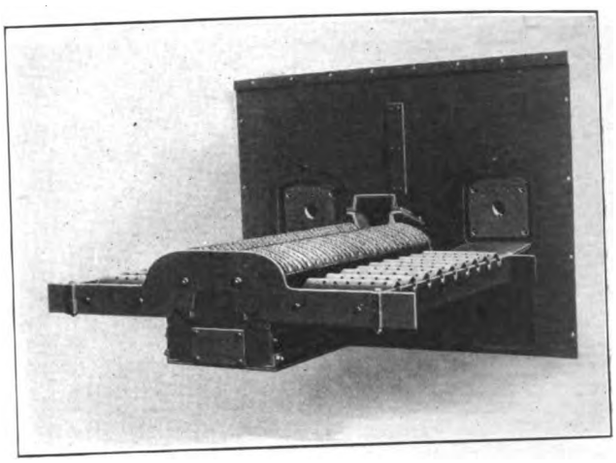


Fig. 9. The Type "K" is a single retort underfeed stoker similar to the Type "E", but without moving grates adjoining the retort. To either side of the tuyeres are shaking or dumping grates from which the ash falls to the ashpits underneath.

The salient characteristics of each type of mechanical stoker have to do, as mentioned above, with the manner of feeding the coal to the fire. In the chain grate stoker, the coal is fed onto a grate which travels through the furnace. Here the grate moves continuously; the fuel bed remaining stationary with respect to the grate. This general type is required for coals of a high ash content, with low fusion point; in other words, coals subject to clinkering. With these coals the fuel bed must not be agitated.

Overfeed stokers feed the fresh charges of coal over the existing fuel bed, after which reciprocating or shaking grates keep moving the entire fuel bed toward the ash-discharge point, agitating the coal all the while.

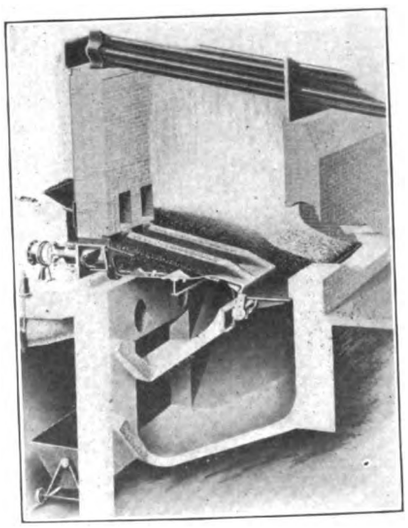


Fig. 10. The Jones "A-C" is a multiple retort inclined feed stoker standing, in point of development, midway between the horizontal single retort type and the super stokers of the Riley and Taylor types.

Underfeed stokers feed the fresh fuel under the existing fuel bed, after which pushers progressively move it upwards and towards the ash discharge point, likewise agitating the coal all the time.

Both underfeed and overfeed stokers, then, are best adapted to coals of the coking type, from which in the early stages of combustion large amounts of volatile matter are distilled. The continual agitation of the fuel bed is needed to break up the masses of coke, to allow the air to penetrate the fuel bed. Here it is seen that high ash-content coals, with low fusion temperatures, are not suited for efficient operation.

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Scope of the Electrical Furnace

By Carroll Wilson

LET us define clearly the meaning of the word "furnace" before we proceed to a discussion of electrical methods for heating them. For our own purposes we shall apply it to any device in which a charge is heated to or held at temperatures above 700 degrees Fahrenheit.

The general scope of the electric furnace is fairly well shown in our chart of applications; though of a truth that lacks much of completeness. We note that for very high temperatures the arc and induction furnace are most suitable, while the metallic resistor type is most widely used for those processes requiring lower temperatures.

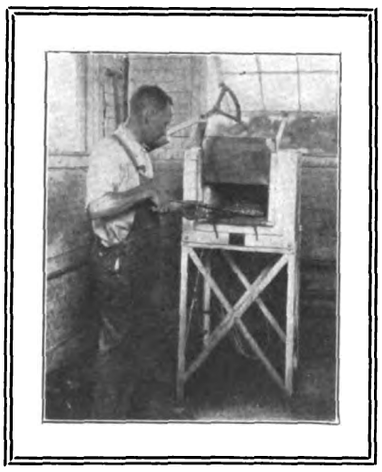


Fig. 1. Electric furnaces have come to stay. Like everything else, they must be adapted to the purpose for which intended.

The chart shows us, too, that the number of applications of the metallic resistor furnace greatly exceeds those to which the others are especially adapted. Accordingly, and because the arc and induction furnace have been more thoroughly discussed by others in the past, we shall not devote further attention to them here. This does not mean necessarily that we consider them of less importance; but merely that interest in the other type will be more widespread.

Any metallic resistor furnace consists essentially of the following: first, a chamber in which the charge is placed to be heated; second, one or more electric heat generators formed of metal wires, rods, ribbons, or castings, and so mounted and distributed that they transmit heat to the charge effectively; and finally, suitable insulation surrounding both the electric resistors (heat generators) and the chamber, to hold losses of heat at a minimum.

Some means for controlling the furnace temperature must be provided; for example, switches or a rheostat for manual control, or suitable instruments and electrical relays for automatic control. The furnace equipment may or may not include a mechanism for conveying the charge through the heating chamber. Furthermore, some processes will require variations and refinements of these essential features, far too numerous to describe here. Finally, need we say that an adequate supply of electric power is indispensable, and that it must be of the characteristics for which the furnace is designed. The illustration below shows a typical furnace suitable for light tool room work.

Many types of resistors are in successful use today. These generally fall in one of two classes; the first of which might be termed the "built-in" resistor, and the second, the "unit" resistor. The former is used as a rule in the construction of small, standard furnaces, and of large furnaces, specially designed. In the electrification of existing fuel-fired furnaces, however, the unit heater, complete with its heating element,

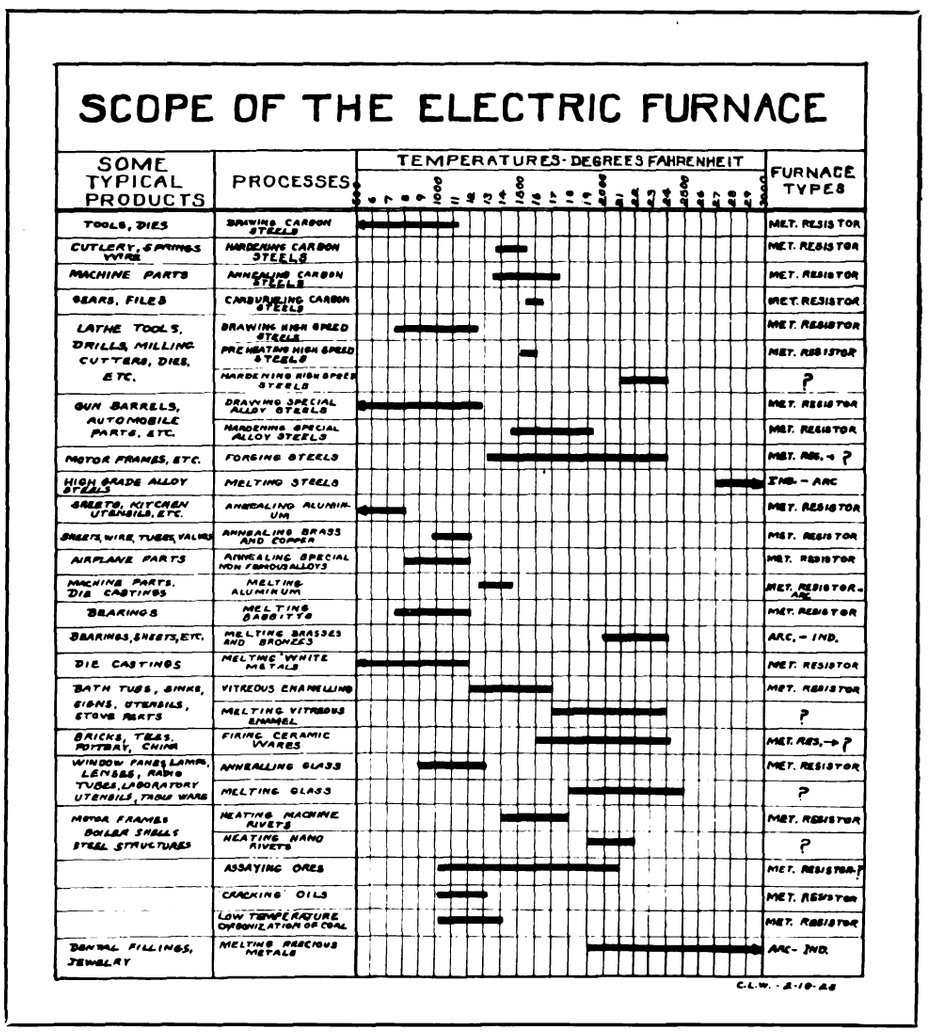
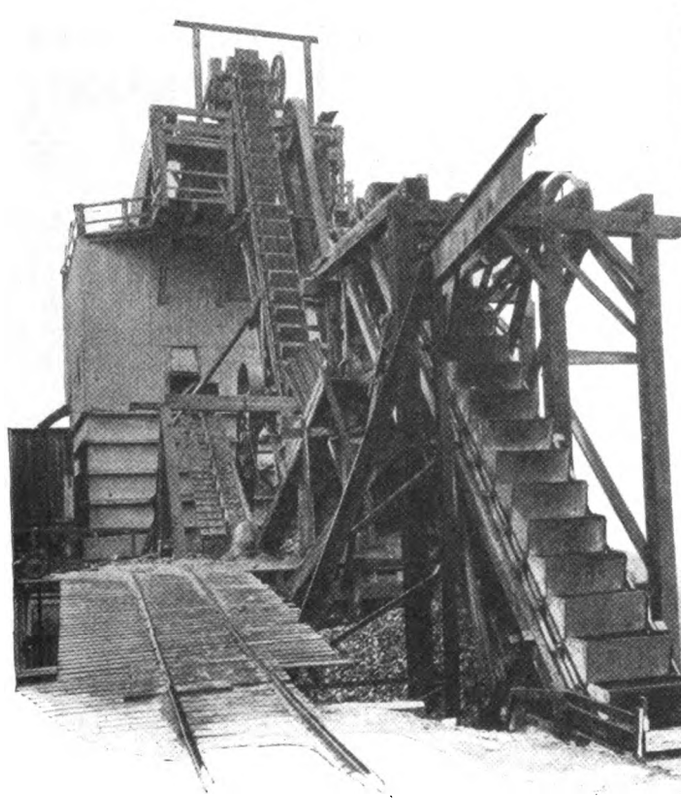
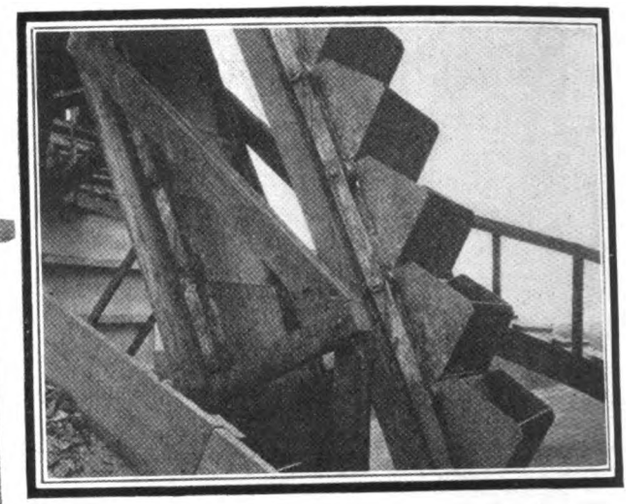


Fig. 2. The accompanying chart is a guide to the temperatures required for various heating processes on typical shop products.

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These Jeffrey Elevators, 63 and 72 feet centers, are now successfully handling 1,200 tons of stone per 10 hour day, and are capable of handling up to 2,000 tons.

Five Men Operate Entire Plant

at the Dan Evans Stone Company

A TYPICAL example of how hand labor is reduced to a minimum by the use of mechanical handling equipment is demonstrated at the plant of the Dan Evans Stone Company, Marion, Ohio.

Only five men are required to operate the entire plant; one man for operating car puller, two for dumping and feeding crusher, one to load graded stone out of bins, and one general utility man who oils and looks after the machinery.

In large or small plants, for handling bulk or loose materials, raw or finished products, there are Jeffrey Standard Equipments to meet the requirements.

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electrical insulation, and supporting frame, is most useful. The flexibility in application of this type makes it a valuable supplement of the built-in resistor, for the heating of certain furnaces of odd shapes and sizes. Again, the unit heater is advantageous for exceptionally severe service, because it is so easy to replace.

He who is responsible for the selection of a furnace or of many furnaces, must base his decision on certain fundamental desiderata. It is really surprising to find how many and how varied are the factors which can and will influence him. Of course, very often the application will be of too little importance to justify a thorough analysis; and it is seldom indeed that all or most of the factors can be exactly evaluated. And again, some one item may stand out so prominently that it is unnecessary to give second thought to the others. But let us see what they are.

First, we have those considerations that would apply to any furnace, large or small, electric or fuel-fired. Its dimensions and type must be suitable for the work. They must also conform to the quantities of product involved and to the degree of service continuity required. Convenience in operation is essential, in order to conserve time and labor. Heat distribution within the furnace must suit the work, and temperature control must be well within the limits demanded by the process. The installation should be thermally efficient; hence, all heat that enters the furnace should be utilized to the fullest possible extent. Space occupied by the furnace plus its auxiliaries should be a minimum. The design and construction should insure low maintenance charges; and unavoidable repairs should be easy to make. All these characteristics should be so combined and so balanced that the operating cost plus fixed charges will be as near a minimum as possible.

Neither electricity nor any fuel is universally desirable. How shall we know which to choose? Consider spoilage, for instance. Do present methods give a large number of rejections, in proportion to the total production? Results obtained in other plants using electric or fuel-fired furnaces for similar work may help in deciding this point.

Do present methods produce uniformly high quality? If not, should they; that is, would the market pay a premium to get it? If electric heat will reduce spoilage, in a given process, it may very probably go even farther and improve the quality obtainable.

Not only should we know competitive unit fuel costs; but also how much fuel or electricity the device will require per unit of product. The thermal efficiency of a well designed electric furnace can always be made higher than that of the best equivalent fuel furnace. Furthermore, the average economy obtained with normal operation is fully as important as the best possible economy; and it is safe to say that the average will be far nearer perfection with electric heat, especially if automatic control is employed.

High first cost of electrical equipment might often prove discouraging were the other factors neglected. One point should not be overlooked, however. The disparity in furnace prices is often much exaggerated, through failure to account for auxiliaries. Shall we not agree that competitive cost includes the cost of any and all auxiliaries without which the furnace could not produce those results for which it is designed?

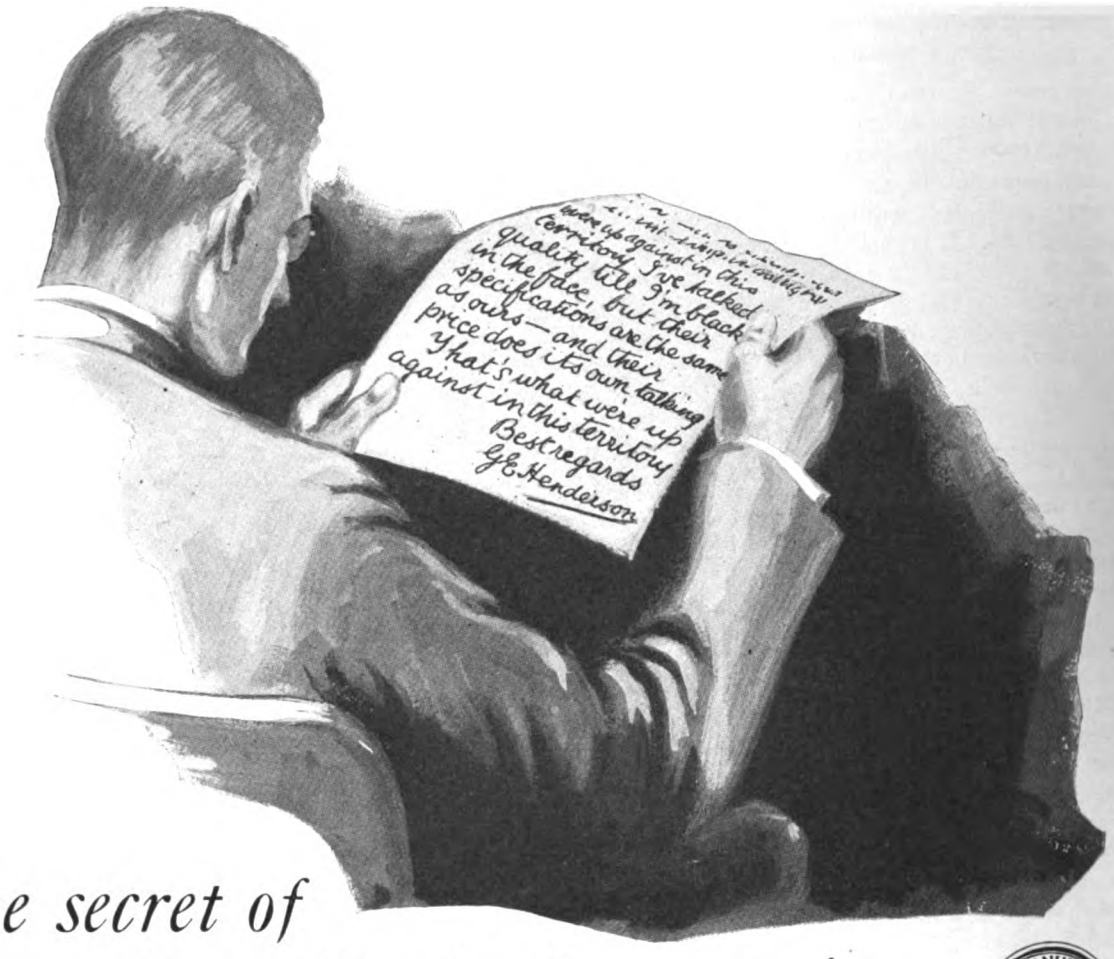
The Westinghouse Company, in one of its own plants, has installed a battery of electric furnaces for heat treating cupromanganese turbine blades. Previously, when gas furnaces were used, the ever present heat and noxious fumes made it impossible to keep a man on that work for more than nine weeks. The electric furnaces were placed in service in 1921; since then, the operator has been changed only a very few times. Service was so severe that it was necessary to rebuild the brick work and replace the gas burners every four weeks. The electric furnaces operate continuously in the daytime and frequently at night. Since installed, they have had scarcely any repairs. They have doubled production without requiring more labor. So successful have they been that seven more have been added to their number. Although the power rate is low, it is nevertheless interesting to note that electricity competes here with natural gas selling at much less than fifty cents per thousand cubic feet.

Another application, quite different, is the use of electric crucible furnaces for melting babbitt. This should be of especial interest to those who are concerned with the manufacture or maintenance of rotating machinery. It has been found that the temperature at which babbitt is poured has a great effect on the wearing qualities of bearings made therefrom. The automatic electric melting pot has proved itself ideal for this work in years of service tests. Not only will it produce uniformly good babbitt, but experiments have shown that the cost of electricity for operating it is about the same as the fuel cost for an equivalent pot burning cheap natural gas.

There is nothing mysterious about the problems connected with electric heating design; yet many are still imperfectly understood, even by those best informed. The electrical problems are simplicity itself; and that fact leads many a novice to disregard entirely the very real thermal and mechanical difficulties. To solve these and to produce successfully the precision machine that an electric furnace should ever be, requires a high degree of both motive ability and technical training. Purely practical men, able though they may be, will have trouble in adapting their accumulated skill to this work. For these reasons, we believe that only those concerns which employ very capable engineers should attempt to build their own electric furnaces, if these be at all important.

Before we close, a few suggestions for those who at some time will have charge of electric furnaces may not be amiss. Why expect the impossible simply because the apparatus is electric? Conditions in the heating chamber of such a furnace, properly designed and built, and intelligently applied, can be made to fit the requirements of any given application. Furthermore, other things remaining unchanged, these conditions will not vary, year in and year out. In other words, the furnace can be made to produce the desired effect on the work always. But it cannot correct poor materials, or improper treatment given in either previous or subsequent steps of manufacture. Of course, in eliminating a certain number of variables, it makes for greater ease in the detection and removal of other causes of trouble. Let the furnace be operated in the manner for which it was designed. For instance, there is no sense in finding fault if it fails to handle two or three times the intended production. The mere fact that the best apparatus will stand hard service is no reason for abusing it.

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The secret of the other fellow's lower price

WHETHER you manufacture needles or ocean liners you face the age old problem of a competitor in the same quality class cutting prices. "How do they do it?" you ask; for you know that their production methods are no better than your own.

But therein lies the answer—your efforts are probably too much centered in one thing: making your product. When it comes to production you can meet any competition, *but*—

Suppose the other fellow's power costs him 10, 15 or 20 per cent less than yours—not at all unlikely if your power plant is incorrectly fired. Isn't it barely possible that in concentrating on manufacturing your product you are forgetting that one of your largest production items is power cost?

When you put your coal burning problem before the manufacturer of a fullfledged mechanical stoker, you receive the counsel of competent combustion engineers with long training in cutting coal costs and boiler room labor costs. The advice given by these engineers will be sound, because experience has shown them that mechanical stokers must be installed on a basis of engineering facts which foretell a definite saving.

On this basis the installation of a mechanical stoker, planned to meet your exact requirements, is certain to produce a greater saving than you can effect by any single improvement in your manufacturing methods.

This is one of many points covered in the free book, "Coal—the *Basic* Fuel." Write to the address below for your copy.



The book is free

BURN COAL

"The *basic* fuel"

STOKER MANUFACTURERS ASSOCIATION

W. V. McAllister, Secretary, Foot of Walker Street, Detroit, Michigan

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Ten cars of coal—or nine?

Mechanical stokers save coal by increasing furnace efficiency. They also make it possible to burn cheaper grades and sizes of local coal. Ten per cent saving is a conservative estimate.

Five men or three?

Stoker firing will cross at least two men off the pay roll if adopted by a hand fired plant now requiring five men. The better working conditions appeal to a better, steadier class of men.

Four boilers or three?

Greater steam demands can be met without adding to your present boiler equipment. Three boilers can be made to do the work of four through the higher combustion rate made possible by—

STOKER FIRING

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A Practical Campaign to Save Eyesight

By Sanford DeHart

Director of Employment and Hospital
The R. K. LeBlond Machine Tool Company



Fig. 1. Under such conditions as these, grinding becomes an extra hazardous occupation with no goggles, no guard about the wheel, and every chance of injured hands besides.

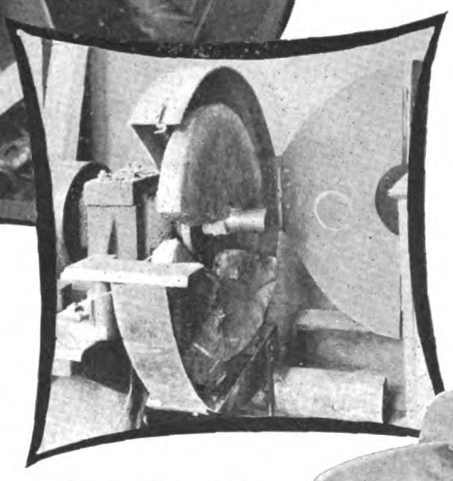


Fig. 2. When this wheel, traveling at a surface speed of 5,372 ft. per min., burst, the steel guard prevented any damage.

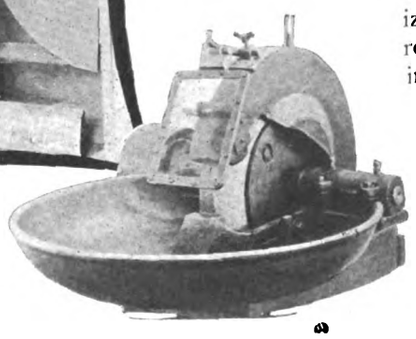


Fig. 3. A glass shield which protects from flying sparks and pieces of metal or stone.

AN idea of the economic value of reducing eye accidents can best be illustrated by our records, which show that the first year our accident campaign was inaugurated to minimize the severity of eye accidents, 5,016 foreign bodies were extracted from the eyes of our employees.

Our abnormal number of eye conditions was no exception to the rule of what happens when the management interests itself in a good cause. The result was that in four years our records show that instead of more than five thousand foreign bodies being removed in one year at a cost of more than $3,000, there were only 789 pieces removed in one year, at a cost of $7.50.

The procedure we followed in reducing this type of industrial injury is so obviously simple that it is within the reach of the smallest plant. In the first place, we started a bulletin board propaganda with material furnished by the National Safety Council. I cannot say too much for the valuable aid this organization was able to render us in this connection. In the bulletins furnished by this organization, the worker is able to visualize for himself the end results of neglecting eye injuries.

Frequently the worker would come in with a piece in his eye after seeing one of these bulletins graphically illustrating the dangers of not having the piece aseptically removed, and exclaim: "Gee, after seeing that picture on the bulletin

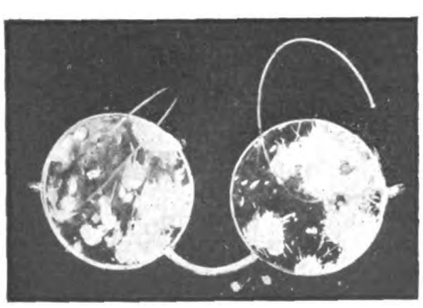


Fig. 4. When babbitt metal went on a rampage, the man who wore these saved his sight.

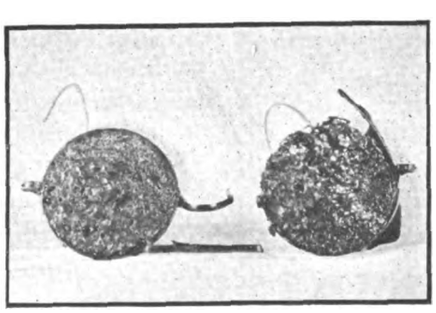


Fig. 5. An explosion of molten metal did this; but the eyes were saved.

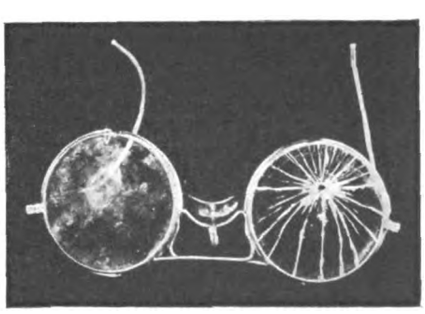


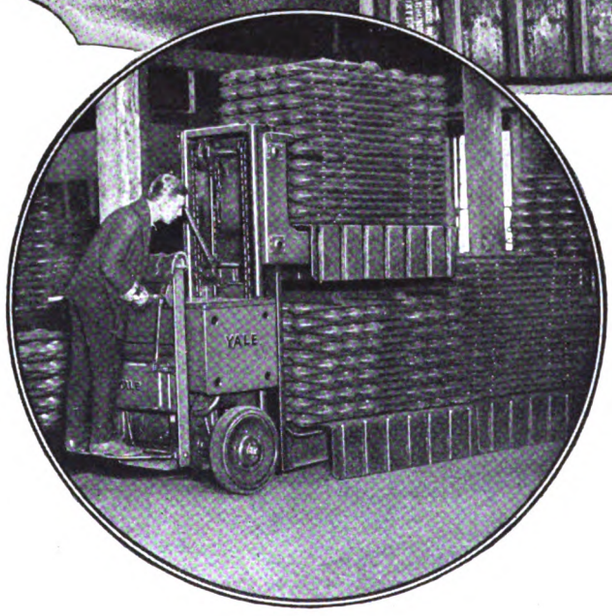
Fig. 6. A flying particle of cement spent its force on the goggle, instead of on the man's right eye.

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YALE—the Key to lower handling costs. Chapter 20 on *Storage Battery Trucking*.





Another substantial saving with Yale Industrial Trucks

Yale industrial trucks were recently installed at an eastern radiator plant. The system starts in the foundry and ends on the shipping platform.

Radiator castings, knocked from the molds and placed on skids, are hauled to the cleaning room by a Yale K22 Truck with one operator. A belt conveyor takes them to the testing room. From there the handling is entirely by truck.

The operator picks up a skid load of rough sections on the elevating platform of the Yale K22 high-lift Truck, hauls them to the boring machines, from there to the assembly, and then carries the finished radiators to storage and tiers them two-high.

The Yale K22 with *one* operator handles a 70% greater load than two men and a hand-lift truck. It saves 60% of the labor and has provided 40% additional floor space.

Ask us about low-cost material handling in Yale equipped plants similar to yours.

The Yale & Towne Manufacturing Co.
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YALE MADE IS YALE MARKED

Yale Material Handling Equipment includes Spur-Geared, Screw-Geared and Differential Chain Blocks, Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment. To acquire locking control, security and convenience throughout the factory use Yale Master Keyed Locks.

YALE Hoisting and Conveying Systems

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board you can bet I won't have any inexperienced person fool around my eye."

We experimented with fourteen different types of goggles before we finally adopted a pair that suited the requirements for general work.

In the ten years that we have been trying to reduce eye accidents, I only recall one salesman representing a goggle manufacturer calling on us. It strikes me that there is a big field for this sort of thing. However, that's a question for the goggle manufacturers to fight out.

State factory inspectors have long known that grinding wheels are a constant source of danger. They know that the hazard of bursting grinding wheels has long been recognized. Most manufacturers of grinding wheels furnish effective guards which are designed to

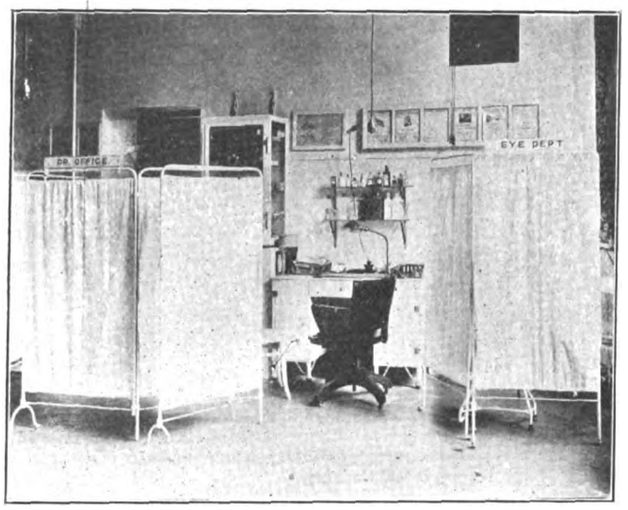


Fig. 7. An "eye room" requiring no structural changes in the plant hospital department.

minimize the effect of broken wheels. The additional hazard of the flying sparks which often become embedded in the corner of the eye is the most difficult eye condition with which the industrial physician has to deal.

This hazard is minimized by placing a glass shield over the wheel. An approximate idea may be gained of the hazard present in grinding wheels, when it is known that in actual practice wheels are run at a surface speed of from 4,000 feet per minute, up to as high as 7,000. The cup form of wheel, owing to its shape, is doubly hazardous, as it is considerably weaker. This type wheel should be operated at a lower speed to avoid accidents.

Some of the eye conditions which we discovered in time to be corrected before they became serious were due to light, heat and chemical rays and poor illumination. In this connection, I might add that intense light is a more prolific source of serious eye conditions than are foreign bodies which have become adherent to the eye ball.

Protection from injurious radiant energy with a reduction of intensity of light is very easily remedied. Anyone interested in this phase of industrial eye work will find a small book issued by the Department of Commerce, Bureau of Standards, Washington, D. C., well worth a perusal. This handbook can be obtained from the Government Printing Office for ten cents.

Don't take our word for it—

THERE'S only one way to find out whether it will pay you to use Grinnell Hangers. Try them. Buy a dozen and use them on a part of some job. Compare labor expense and the finished work with the balance of the piping.

You're the judge and the jury. Put Grinnell Hangers on trial. See if they are not fully adjustable, easy to put up, sturdy, well made, with perfect threading and you'll see why they make better jobs with less labor.

Send for our free 120-page catalogue. If your jobber doesn't stock Grinnell Hangers, ask us for the name of the nearest distributor. Address Grinnell Co., Inc., 307 W. Exchange St., Providence, R. I.



Use a dozen and see why we've used a dozen million

GRINNELL
Adjustable
PIPE HANGERS

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Try this test . .

Your man in charge of material-handling can tell you how well the electric industrial truck battery does its work. Your bookkeeper can tell you how much or how little the battery costs to operate.

It is easy to find out what type of storage battery is most effective and economical. Why not do as many other up-and-coming plant managers do—let the figures on your own ledger show you which type of battery powers trucks at the lowest cost per month and per ton.

Cut another slice from your handling costs

SOON after you put electric industrial trucks on the job, your cost records began to tell good news. Are you overlooking an opportunity to cut *another* slice from the cost of moving materials and work-in-process?

Try this test. Next time you replace a truck or tractor battery, slide an Exide-Ironclad into the battery box. Tell your bookkeeper to check every penny of cost—battery depreciation, repairs and replacements and the cost of current. Tell him to give you separate cost figures every month on that battery.

You will find that the cost-per-month of the Exide-Ironclad Battery is surprisingly low. That is why so many far-sighted plant managers equip all of their electric industrial trucks and tractors with Exide-Ironclad Batteries.

The Exide-Ironclad Battery is reasonable in price. It is built for rough work—you will seldom find it on the repair bench. Because of its low internal resistance and high watt hour efficiency, this rugged battery is a thrifty user of current.

This low-cost battery is also the battery best fitted for material-handling work. Heavy loads, steep ramps, rough going of any sort—the truck or tractor will not falter with an Exide-Ironclad in the battery box. There is plenty of speed for the truck, on the *first* run in the morning, on the *last* run in the afternoon.

Exide
IRONCLAD
BATTERIES

A post card puts the interesting booklet, "Facts for Consideration in *Selecting a Battery* for Industrial Truck and Tractor Service" (Form 1874), in your hands. Read it. Then take an Exide-Ironclad Battery and put it through your own test. Check every item of cost. Let your ledger be the judge.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

In Canada, Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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Chain Blocks and How They Multiply Manpower

The Various Types and Their Relative Efficiencies

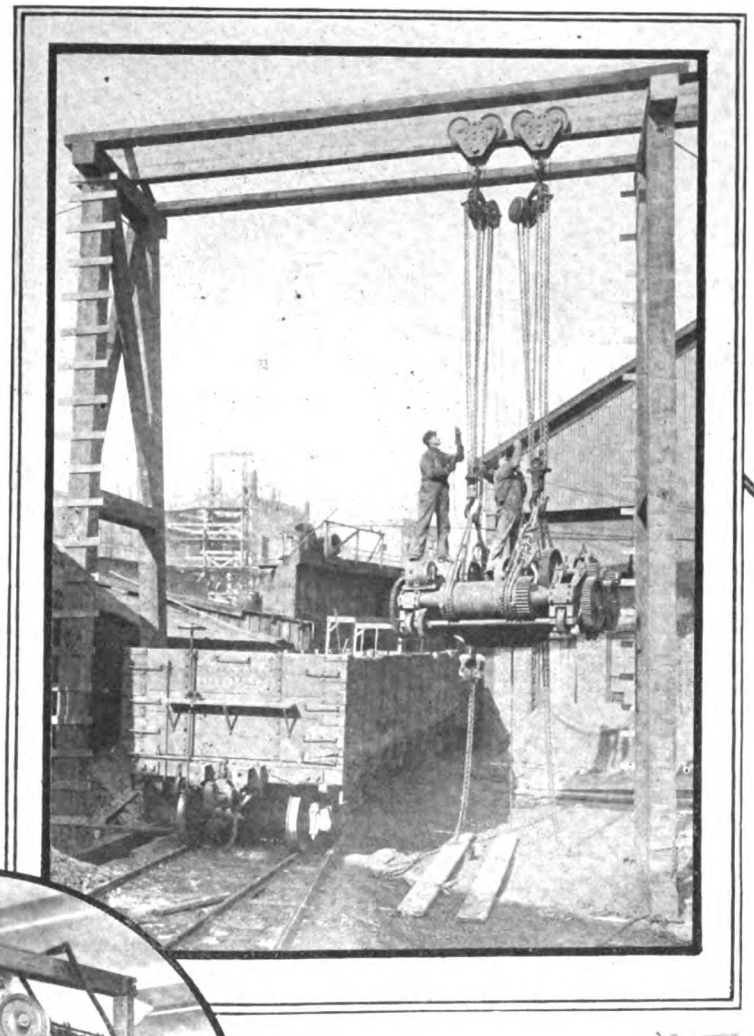
By F. C. Eibell

SO common is the Chain Block in our every day industrial life that many of the younger generation of engineers, superintendents, managers and foremen may be surprised to know that the invention of the Chain Block is only about fifty years old. For years the block and tackle had been used and men knew that they could not let go of the rope without dropping the load. With this new hoist—called a Differential Chain Block—a man could lift 650 pounds with a 72-pound pull. With the most efficient block and tackle made, he could not lift more than 300 pounds with a 72-pound pull. And, with a simple pulley he could lift only 72 pounds with a 72-pound pull.

The Differential Chain Block was unquestionably stronger than the block and tackle. It was evident that with it, one man could do the same work that it previously took a small gang to handle. But what was more wonderful—it actually held the load suspended wherever the operator wanted it. The load was raised and lowered only by pulling on the hand chain.

The Screw-Geared Block was next to make its appearance. This is a very compact Block. When the operator pulls on the hand-chain a worm gear inside the block is turned which winds up the load chain. The Screw-Geared Block lifts much heavier weights than the Differential Block, and if there is a great deal of lifting to be done, this Block is preferable to the Differential type.

Those men who made and marketed the first Differential Chain Block gave to the world the Spur-Geared Chain Block



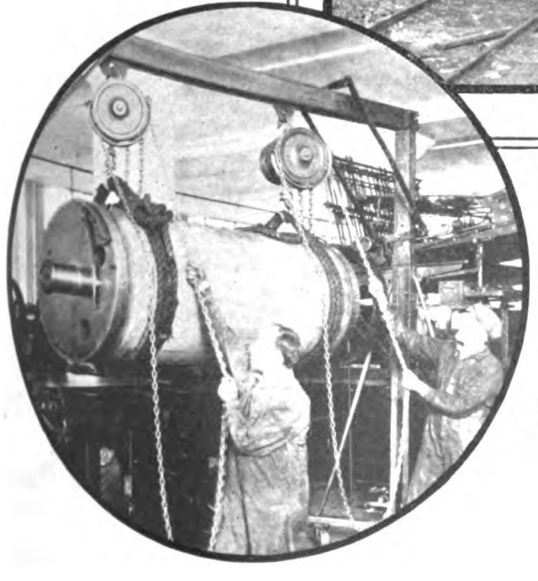


Fig. 1. The use of geared trolleys permits of moving this huge load with a minimum of effort. The pull required on each hand chain is only 35 lbs., for a 20 ton load.

Fig. 2. Setting up new machinery in a printing plant, as simplified by the use of chain blocks.

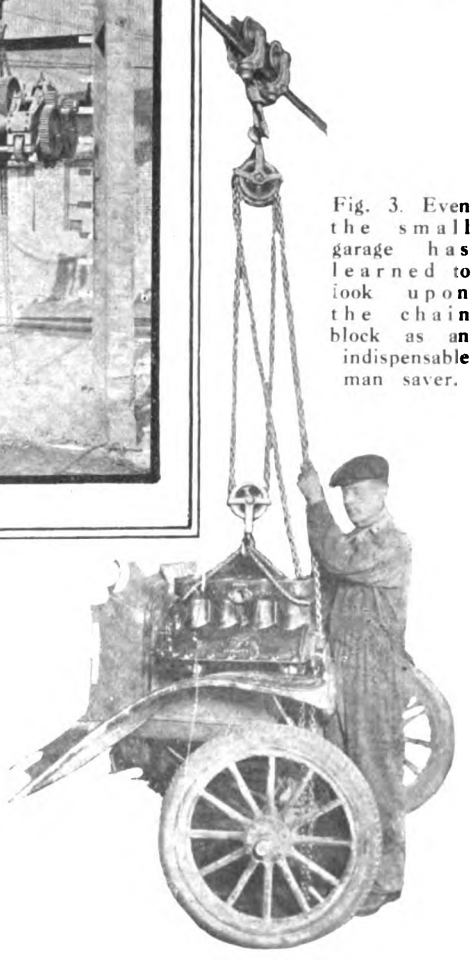
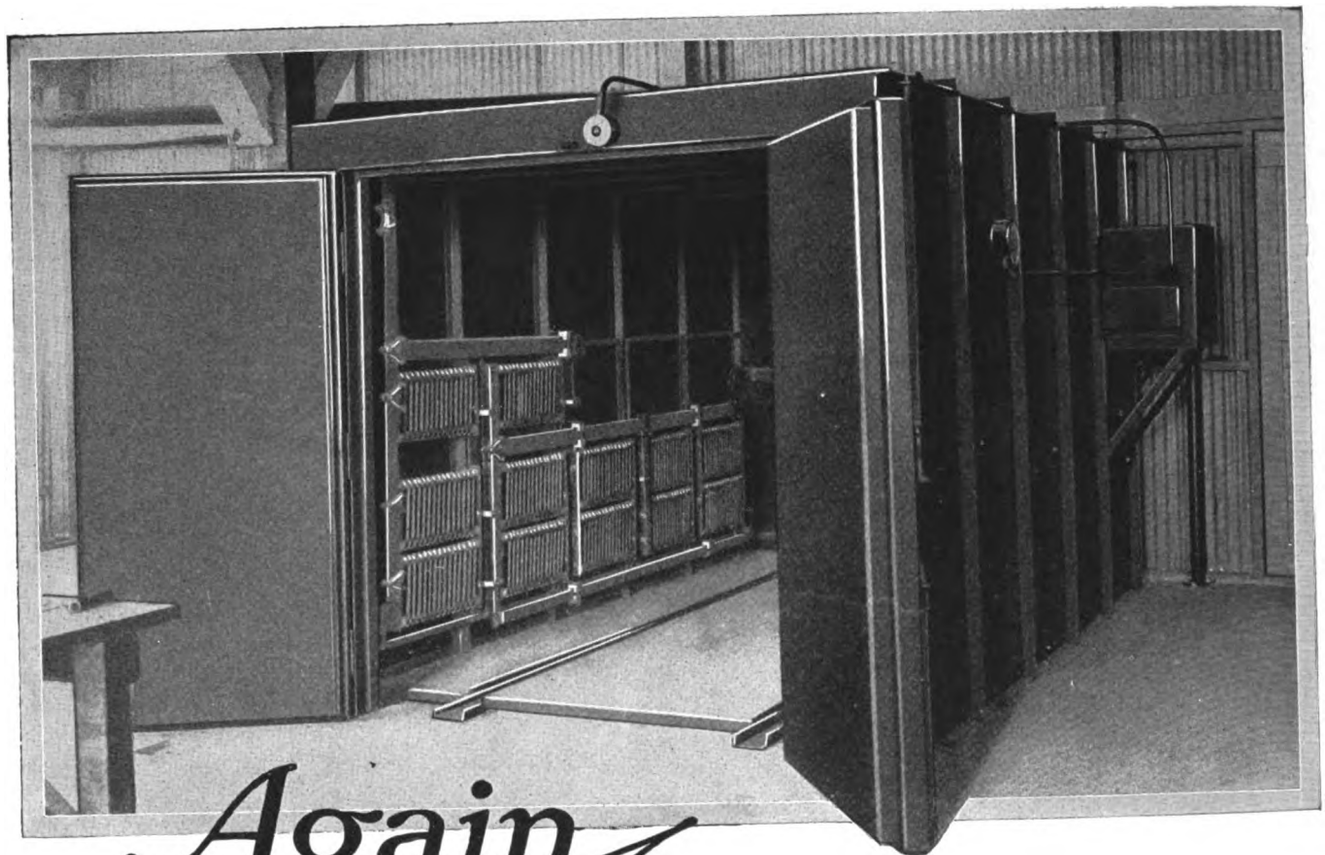


Fig. 3. Even the small garage has learned to look upon the chain block as an indispensable man saver.

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Again

Electric Heat Proves Superior

The results obtained in the core baking oven at the Alloy Steel & Metals Company's electrified foundry, provide material for another chapter in the book, "Electric Heat is frequently the Better Way."

Inside dimensions of this oven are 13 ft. deep, 7½ ft. wide and 8 ft. high. The heaters are mounted on each side wall, arranged so as to compensate for any heat losses through the door. The temperature is automatically controlled.

Baking cores electrically speeded production, improved quality and decreased spoilage because of the even distribution of heat and the thorough drying action over the charge. Burning of cores has been eliminated by the automatic control of temperature.

Your heating problem may be entirely different, yet electric heat—clean, flexible, concentrated—might serve you to advantage. Complete information on request.

Everything in this foundry is done electrically. The metal is melted, the cores are baked and the castings are heat treated and welded with General Electric equipment. Marked improvement and economy in all operations have resulted.

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about 20 years later. With one of these lifting devices one man alone can lift 20,000 pounds. Compare this with the lifting capacity of the old block and tackle and the gang of men it would take to do such a job. Or compare this later development with the original Differential Block which requires 3 men to lift only one ton.

With the Spur-Geared Chain Block, the operator does not have to pull so hard, or so far, as with either the Differential or the Screw-Geared Blocks.

The utility of the Spur-Geared type of Chain Block can be understood better by a practical example. With one of these 10 ton Blocks a man can lift 142 times the amount of pull he puts on the hand chain. This means he can do as much work as 142 men could do if they could concentrate their pulling strength.

One man exerting a pull of 82 pounds can lift a load of 800 pounds 18 inches with a Differential Block. Applying the same pull, he can lift a load of 1,700 pounds 12 inches with a Screw-Geared Block. But the highest efficiency is reached with the Spur-Geared Block, where using the same pull—82 pounds—a load of 2,000 pounds can be lifted 24 inches.

In price, the Differential Block has the lowest first cost, as well as the lowest in efficiency. But it has many suitable applications in industry. Where the use is only occasional, where plenty of extra help is available, if needed, and where the economy of time is unimportant, this block should be used.

The cost of the Screw-Geared Block is about twice that of the Differential Block, and its efficiency is about 1/3 greater. It stands midway in cost, efficiency, and general usefulness between the other two types of Blocks. Its smooth running characteristic makes it especially suitable for use where any jarring of the load is to be avoided.

In cost, the Spur-Geared Block is about three times that of the Differential Block and one-half more than the Screw-Geared Block, but its efficiency is three times that of the former and double that of the latter. Where the saving of time, of men, and of machines is important, the Spur-Geared Block is unquestionably the choice. This block represents the highest development in hand hoisting machines. Its original high efficiency of 80% has been increased by adding ball bearings to the load sheave. One remarkable thing about a properly designed spur-geared block is that its original efficiency is unimpaired even after many years of severe service. Wherever loads must be lifted and lowered quickly and often, the Spur-Geared Type of Chain Block will be found to be the most economical hand hoist made.

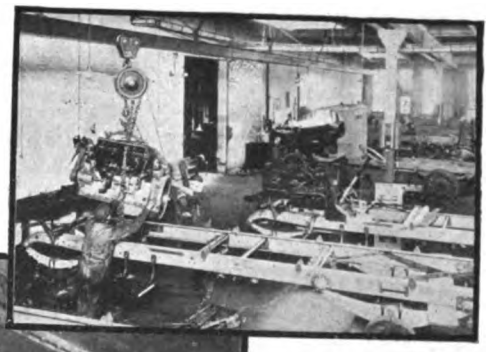


Fig. 4. Automobile assembly in a repair shop, where two men do easily what would otherwise require a gang of six.

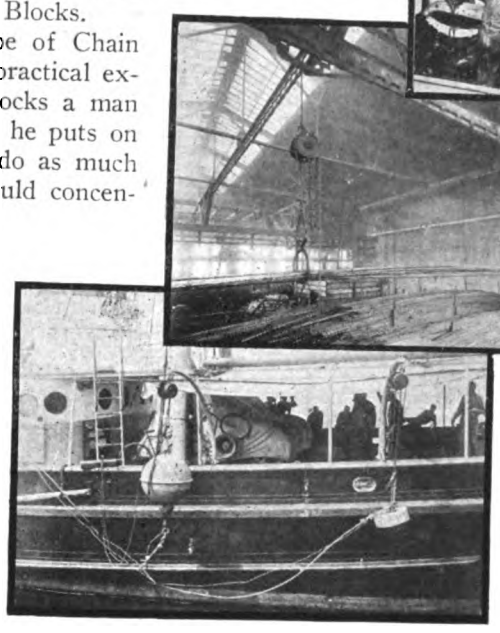


Fig. 5. Note how this block is equipped with special tongs for gripping pipe or bars.

Fig. 6. Two chain blocks hooked to the davits of one of Uncle Sam's mine layers.

Fig. 7. High piling in a warehouse, made possible by an I-beam and chain block with but two men.



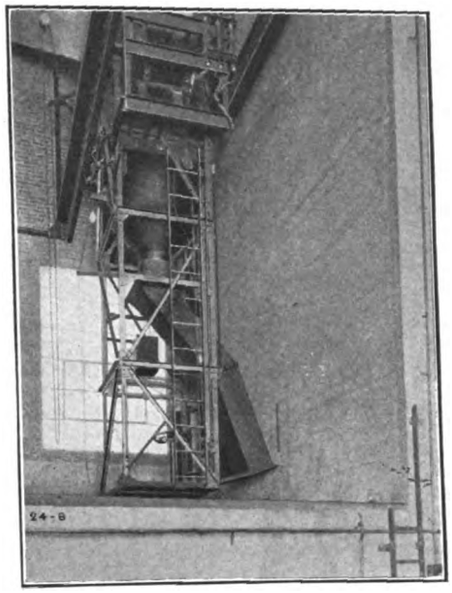


Fig. 8. A handy installation in a storeroom where heavy parts must be handled.

Fig. 9. These burial vaults weighing 1,485 lbs., are readily lowered into place by this portable rig.

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Keeping *Outgo* Smaller Than *INCOME*



Hunt Weigh Larry in the Gas Plant of the Philadelphia Suburban Co., Chester, Pa. This Weigh Larry, Hopper and Chute are completely lined with maple wood to protect metal from abrasive action of the coke.

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"You will find thrift—which is another name for good management—has consistently kept *Outgo* smaller than *INCOME*.

"This is the big secret of success in business and industry—the elimination of wastes" (through better ways of accomplishing results) says an editorial note in Industrial Management a short time ago. Continuing it also says:—"This means that superfluous fat is being removed from industry to the betterment of its health. Every pound of superfluous fat that is fried out of outgo means an additional pound of good, healthy profit. A big income or a big volume of sales cannot be called healthful until you examine the all important outgo."

If the executive would only take the time to familiarize himself with his materials handling system, learn the true cost of operation, weed out the imperfections, and replace his obsolete apparatus with modern equipment, he would rid his organization of much of the costly "fat," that makes *OUTGO* larger than *Income*.

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Metal Parts Washing Machines as Money Savers

By Francis A. Westbrook



Fig. 1-a. One big drawback to this method of cleaning lies in the inevitable waste of time.

THE great need for labor saving machinery brought about by high wages has resulted in the extensive use of washing machinery for cleaning metal parts in a wide variety of industries. It is one of those comparatively new operations for which new uses are continually being found.

For instance, a washing machine may be effective in removing tripoli polish and the like from silverware or parts of watches or it may be employed to take off the heavy oil, chips and dirt from steel punchings.

As labor savers, aids to uniformity of quality and general improvement of working conditions, washing machines are beyond question very valuable in many industries. The old fashioned hand operations illustrated in the three cuts had certain very obvious disadvantages. Furthermore there was no way of fitting these hand operated kettles in with mechanical routing plans. In the Dodge Brothers automobile plant, for example, certain parts are carried on overhead conveyors and pass directly through a washing machine and then on to subsequent operations without pause.

A survey of the field in which metal parts washing machinery is used shows it to be not only extremely varied but also that very substantial savings can be made. The absolute cleanliness secured by the combined chemical and mechanical action of a washing machine of the latest type is a further advantage in that it not only insures better results in the operations which follow, such as enameling, japanning, etc., but it also results in less rejections on inspection. A clean piece of metal, moreover, speeds up production in machining operations and causes less wear and tear on the tools.



Fig. 1-b When continuous moving production is such a money maker, it does not pay to halt the product for cleaning.



Fig. 1-c. An important feature of parts washing machines is the elimination of hand scrubbing.

One of the great advantages of these machines is that because very hot water can be used, it has been possible to eliminate benzine, turpentine and gasoline as cleaning agents. These dangerous chemicals were formerly necessary in certain cases because in hand work the men could not put their hands in water hot enough to be effective without these cleansers. The elimination of rags saturated with such inflammable substances means, also, a great reduction of fire hazard, while the saving in brushes as well as rags is an important item.

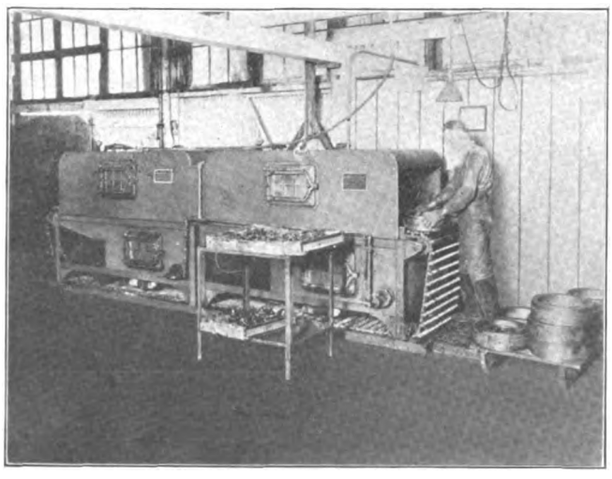


Fig. 2. A modern installation which washes and rinses flywheels and small parts.

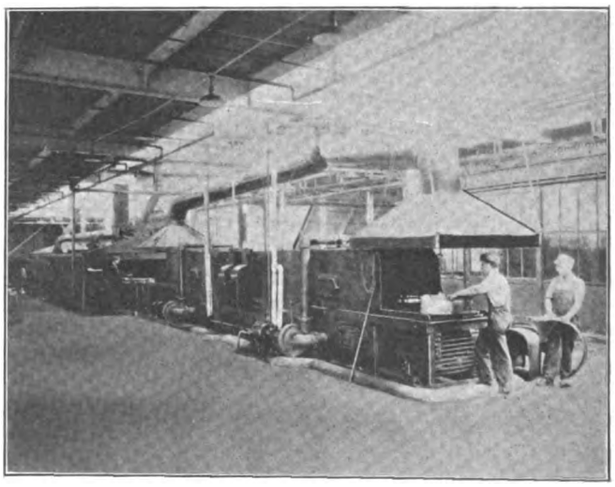


Fig. 3. Machine for washing, rinsing and drying automobile parts prior to enamelling.

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The credit manager, after passing on repair orders, shoots them by tube to the service department.

The service department interprets orders from blue prints, transcribes them, and shoots them by tube to the shipping department.

Incoming wires are received here, typed, and shot by tube to the credit department.



How LAMSON speeds up Osgood repair orders

NO equipment is subjected to more grueling service than excavating machinery. Even the sturdiest machines require occasional replacement of parts. And if a machine is even temporarily out of use, it entails great expense to the user. The Osgood Co., Marion, O., therefore receive many hurry calls from all over the country for repair parts.

It is their pride to handle these orders—many of them telegraphic—with the utmost speed. But with messengers it required 30 minutes to an hour or more for an order to reach the shipping department—far too slow for Osgood Service.

Now, Lamson pneumatic tubes carry the orders from the telegraph desk to credit, to service, and to shipping. Many orders pass through all steps in two or three minutes. The result is better service — orders filled the day received.

Perhaps you, too, have a problem of quick service—perhaps faster paper travel will speed your production and shipments. Undoubtedly there are many places in your office or plant where quickening paper flow through Lamson Pneumatic Tubes will save money as well as building customer good will.

Part of our service is helping you to find points where speed in handling papers will be a paying investment. We will tell you specifically where pneumatic tubes will be worth while, what they will do, what they will save. A call from a Lamson engineer may point the way to unexpected economies.



The shipping department receive their orders within a few minutes of the time wire is received. They can thus ship most orders the same day.

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The cleaning materials used with washing machines are mostly, if not entirely, in the form of powders and it has been found that substantial savings in these is secured because of the continuous agitation of the liquid.

The savings in labor, materials, etc., which have in some cases been secured, have been phenomenal. One concern, the Edmunds & Jones Corp., of Detroit, which manufactures automobile headlights, installed a $5,500 machine which saved $20,000 in the first year. Another, the Oneida Community, Ltd., which makes silverware, saved $13,000 a year with a machine which cost $2,200.

Some of the rather unexpected but perfectly logical uses to which the modern washing machines have been put have been for the cleansing of metals prior to welding, for the cleansing of containers for chemically pure chemicals, and for the reclamation of washed off materials, such as the paraffin used in etching glass and of silver compounds used for film coating materials when their containers are washed. Washing machines are even employed for cleaning the type and rubber stamping plates used for marking burlap and cotton bags, a process which makes them very dirty and which formerly necessitated their being scraped; and for washing cans of plum pudding before labelling. In some cases these machines have been used for slushing paint and other materials, but this should not be attempted unless all apparatus is regularly cleaned every night before the paint hardens.

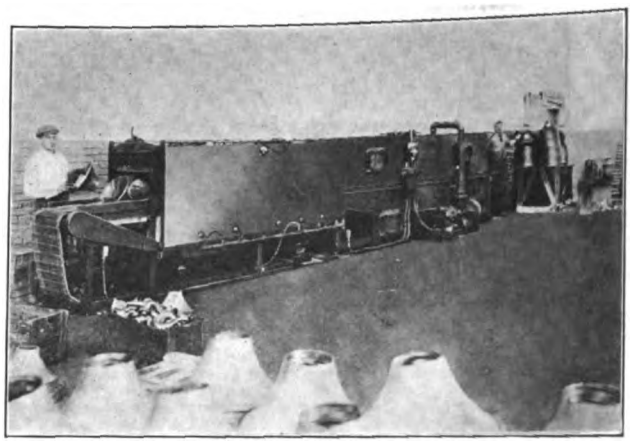


Fig. 4. The above machine cleanses bells for a popular make of loud speaker, prior to coating.

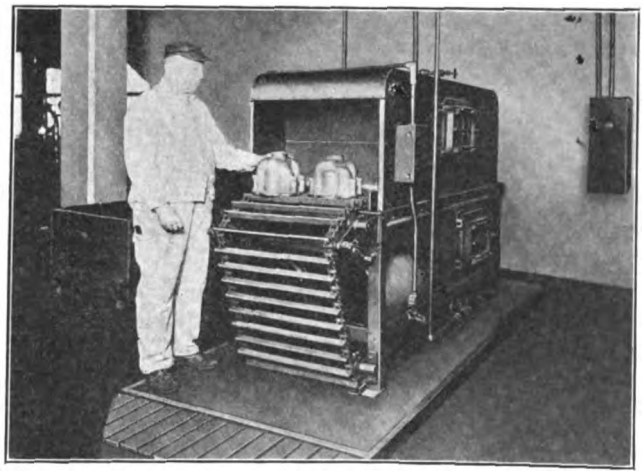


Fig. 5. A simple washer, which washes the parts cleaner and faster than it could be done by hand.

Naturally, such labor savers as these are to be found in the Ford plants. Here, where the whole keynote of successful operation lies in continuous motion of parts through the various operations, stoppage for any one operation must be avoided, if it can be, because of its influence on the whole sequence. By so designing the washing equipment as to synchronize with the preceding and subsequent operations, the parts pass through in a steady flow, just as they do in the assembly line.

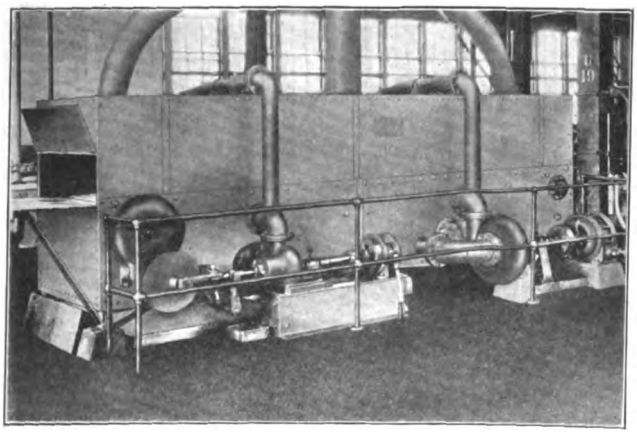


Fig. 6. This washer is used by the Crane Co., in Chicago. Note the location of motors.

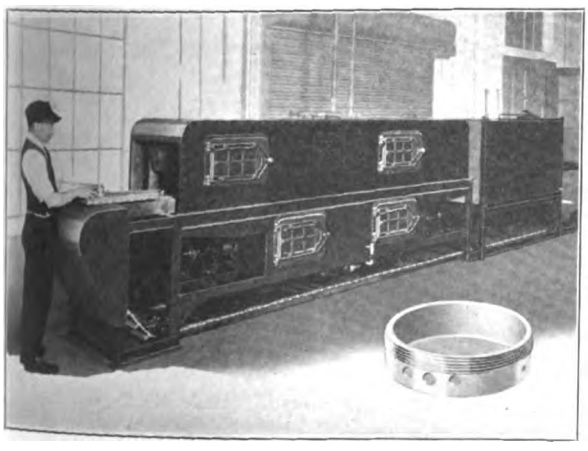
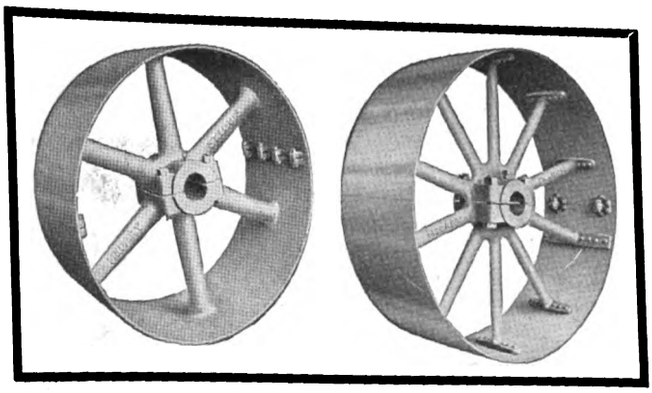


Fig. 7. Machines such as this one wash many tons of metal parts daily; often being run for twenty-four hours at a stretch.

Some of the savings, cited earlier in this discussion, may, at first glance, seem incredible: savings of from five to six times the cost of the equipment, in a single year. Yet, it must be borne in mind that cleaning operations, under old methods, involve first of all an immense amount of labor in proportion to the work done. To reach every nook and cranny of a part, loosen and remove all scale, grease, oil, sand and any other foreign matter, by brushing and scraping, is a time-consuming job even with the help of chemical solutions. Nor can the human hand stand such solutions very hot or very strong. But, by taking the human factor out of the problem, full use can be made both of chemical strength and of heat; by eliminating handling during the cleaning, a vast amount of time, labor, and possible breakage.

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Five distinctly different types comprise the Medart Family of Pulleys—there isn't a situation to which we cannot adapt 100% pulley service.

1 **Cast Iron Pulleys.** Machine-molded 6" to 72". Floor molded 74" to 16 feet, 50" face.

2 **Steel Rim Pulleys.** The original steel plate face pulley. Including Cones and Drums, sizes up to 16 feet and 50" face.

3 **Split Wood Pulleys.** Sturdy glued and nailed construction. All sizes.

4 **"Hercules"** all-steel special heavy duty pulleys, guaranteed to have no equal for unfailing service.

5 **Iron Spider, Wood Rim Pulleys,** combining maximum tractile efficiency with durability and high speed.

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Means Everything in Line Shafting Equipment

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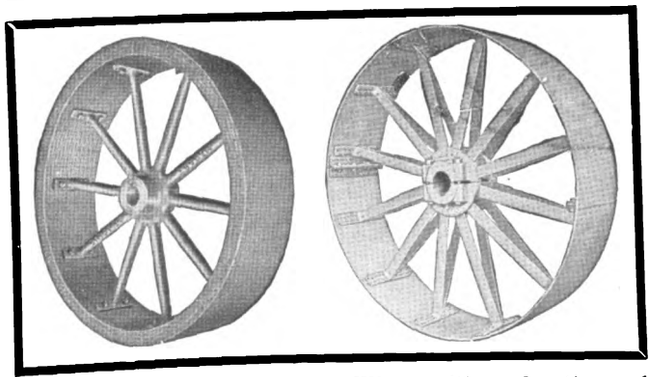
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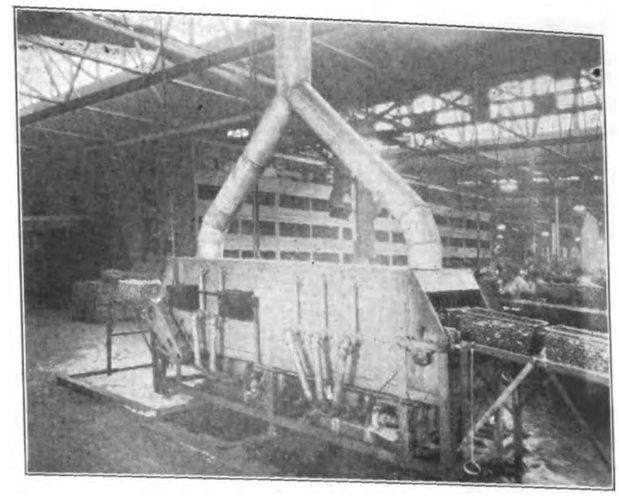


Fig. 8. Baskets of roller bearing parts being cleaned.

is saved; and, through continuous operation, it becomes possible to clean thousands of parts instead of dozens, in the same time and with the same amount of human labor.

There is very little difference in principle between metal parts washers and the more modern dishwashing machines used in the big hotels. Both, in fact, developed from the earlier simple dishwashing machines which met the demand for a method of cleaning not hundreds, but many thousands of dishes, quickly, efficiently, and without a prohibitively large labor force. As these earlier models proved their worth in this field, it was seen that the same principles had many applications in industrial processes. The rest was merely a matter of different cleansing agents, refinements of design, and a study of individual problems. Development, in the past few years, has been extremely rapid; as evidenced by the ever-widening field of application—until now one can boldly say that it would be hard to find a quantity-cleaning problem involving even fairly large parts which cannot be profitably solved by some form of washing machine.

Moreover, manufacturers of these machines have, in the past few years, studied industrial cleaning problems to good purpose; so that the high price bugbear of "special design" is fast disappearing.

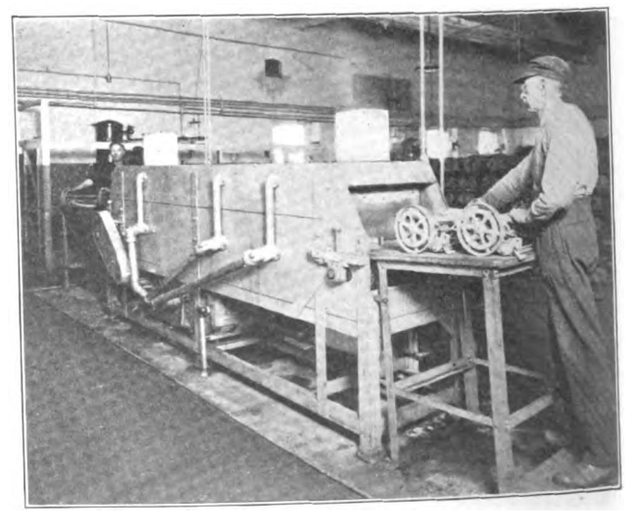


Fig. 9. Lawnmowers are readily made clean, preparatory to painting.

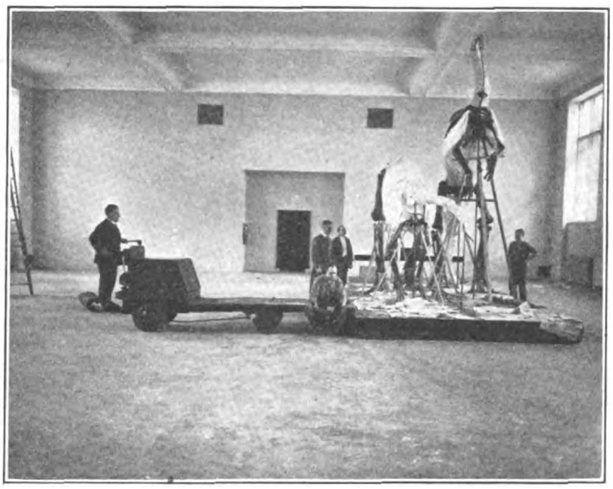
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Even the Dinosaur Bows to Modern Methods

ECHOING through the halls of the American Museum of Natural History, New York, came unusual sounds. Sounds that intruded on the quietness heavy with the weight of time. There was something about them resembling the characteristic hum of American activity, contrasting sharply with that quiet spirit of the past which enfolds the museum.

Following the source of this alien note, one would have come upon a strange scene. In the big vault-like rooms of the new addition called "Dinosaur Hall" a modern electric industrial truck with its motor purring in an ascending and descending scale was busily engaged in pushing and pulling a platform.

Upon this platform were mounted the skeletons of two huge dinosaurs. It was a strange spectacle, for it graphically emphasized the triumph of the human mind.



The strangely incongruous—but highly efficient—method used in moving prehistoric skeletons at the American Museum of Natural History, in New York.

From the Mesozoic Age to the Age of Science—a gap of only a few million years!

This is no doubt one of the most interesting applications of a storage battery industrial truck.

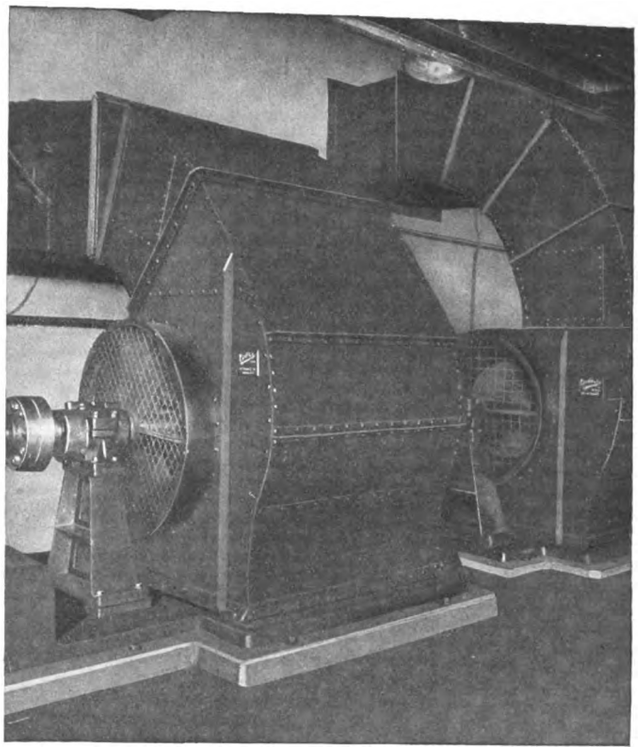
This truck was recently installed by the management of the museum as a necessary step in saving time and effort, for even handling prehistoric bones is frequently hard work.

The first job assigned to the new truck was the moving of skeletons of prehistoric animals, millions of years old, into a new building. The exhibits were mounted on small castors.

The largest one was a skeleton of a duck-billed dinosaur, measuring about 18 feet high, 30 feet long and weighing about four tons. The truck, operated by power from an Exide Battery, pulled it with ease and so carefully that the exhibit was not in any way damaged.

This funny looking creature was one of the wild animals of the temperate and other zones during the Mesozoic or Age of Reptiles.

They were believed to have been egg-laying animals. In fact, a few settings of dinosaur eggs, antedating by several millions of years even the oldest specimen of restaurant hen fruit, have been discovered.



Buffalo Stoker Fan in an automobile factory

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WHAT the huge central station finds satisfactory in the way of mechanical draft apparatus is usually the particular choice of those industrial plants that generate their own power.

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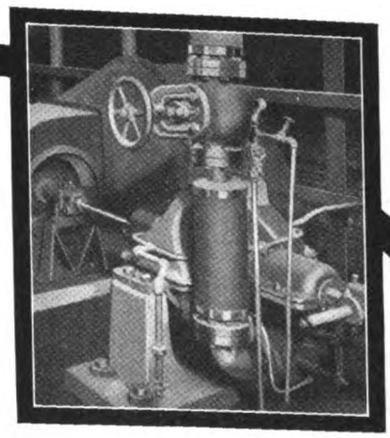
Of course, there ARE real reasons for the popularity of these fans. A new catalog, No. 730-23 tells the whole story. Write for your copy now.

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Leaflet 3907 B explains this and other features in detail. Wish a copy?

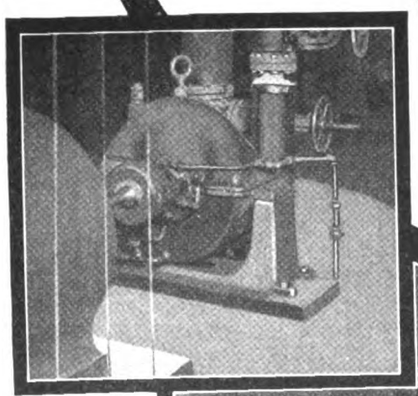
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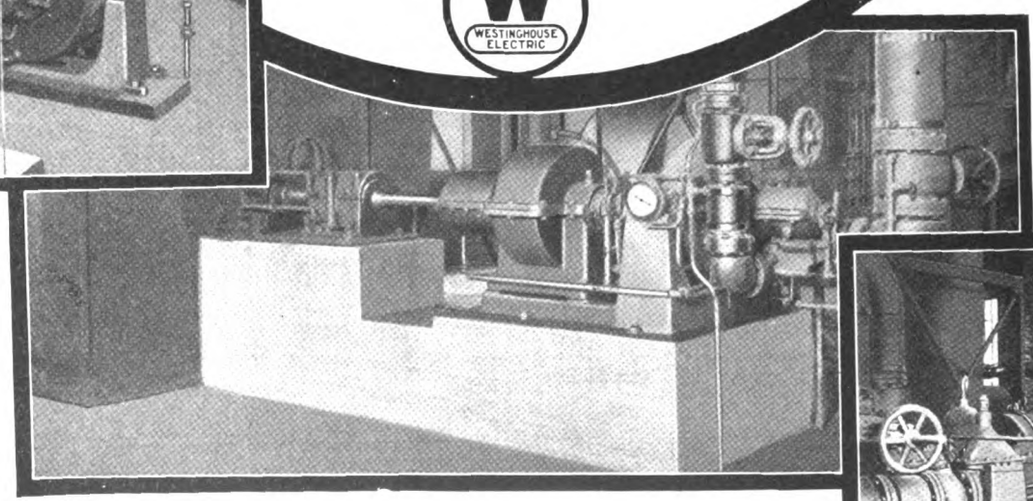
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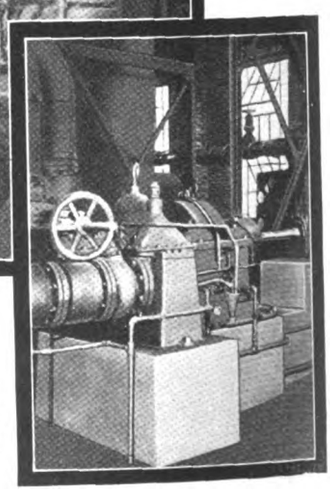
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50-hp., 1300 rpm., direct-connected type MD Westinghouse Steam Turbine.

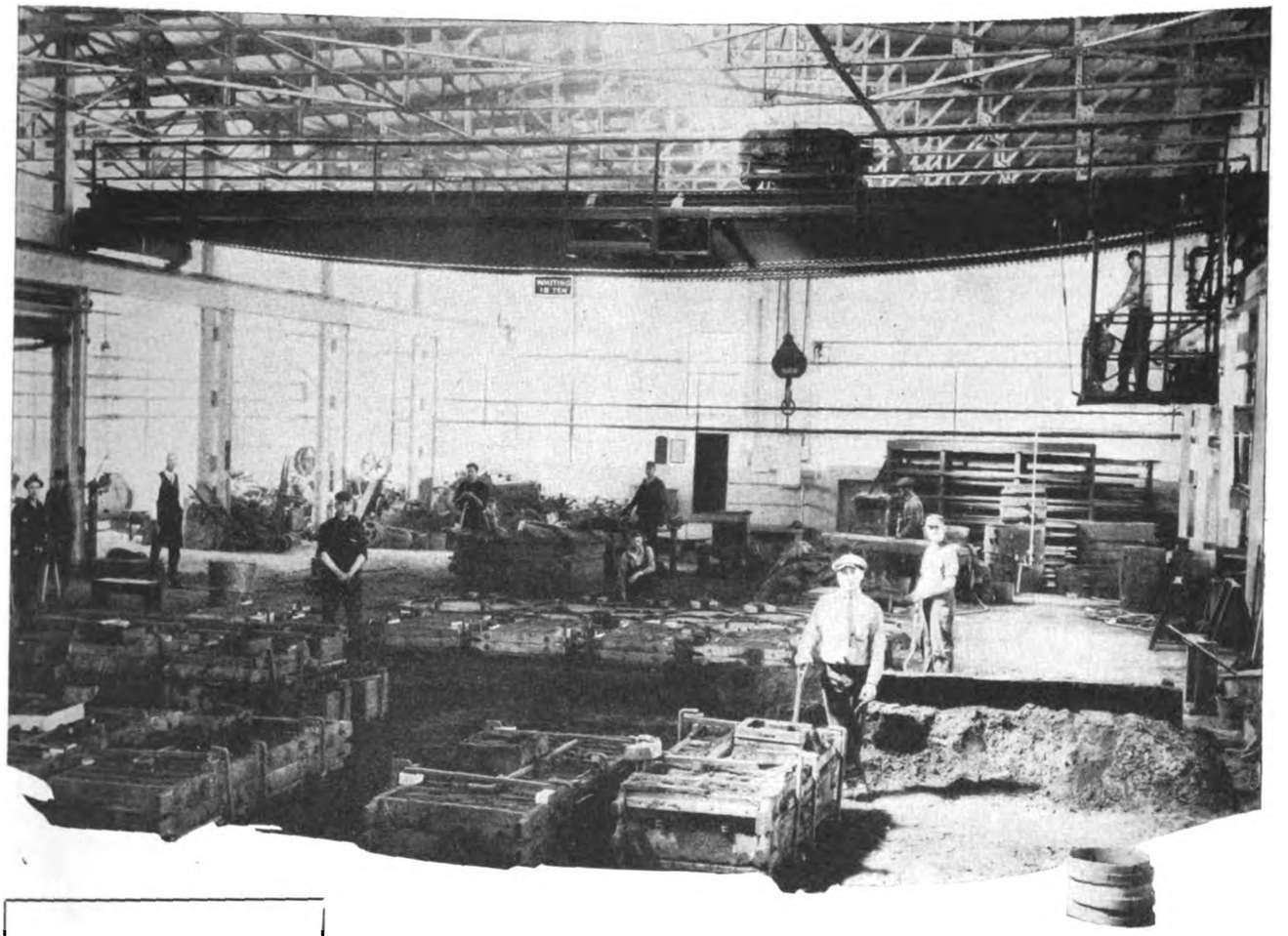


One of three 100-hp., Type MD Steam Turbines, 2820 rpm., geared to 400 rpm., driving exhaust fans at the plant of The Donner Steel Co.



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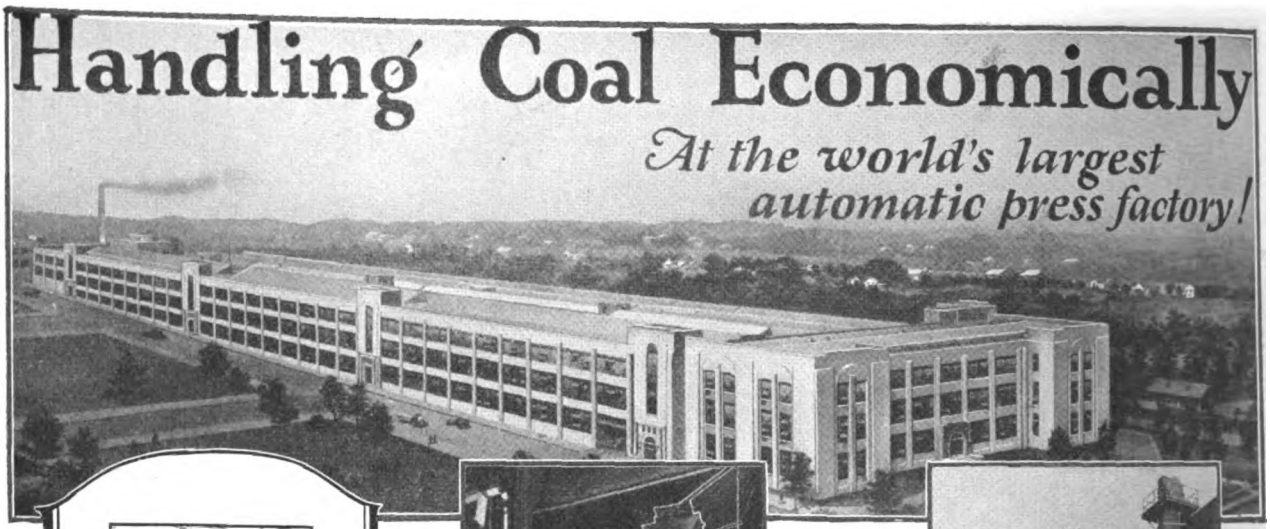
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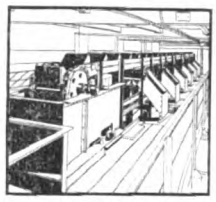
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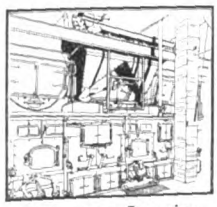




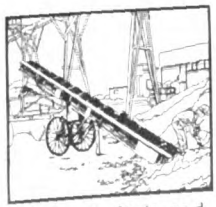
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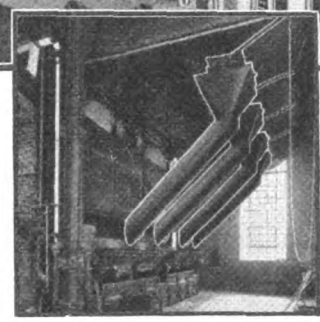
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Power Developments and the Diesel Engine

By R. H. Bacon

RISING fuel and labor costs during the past ten years have had such an effect in increasing the cost of power that every industry has been confronted with the problem of reducing these expenses in order to keep production costs at a minimum. Improvements have been made in steam power plants and the development of water power has been another outgrowth of these conditions.

In the case of the steam plant, however, the maximum limit of improvement has about been reached in the building of large stations. Several of these huge steam stations have an over-all thermal efficiency of about 18 per cent., which is not far from the theoretical limit. This means, however, that only 20 per cent. of the heat in the coal is actually changed into electrical energy.

Labor costs in steam plants have also been reduced to about the minimum by building large turbines and large boilers with coal and ash handling equipment so that fewer men are needed to operate the station. The use of pulverized coal as a fuel has also been introduced in order to gain in fuel burning efficiency and to lower attendance costs.

Water power has been developed in huge projects costing hundreds of millions of dollars and developing enormous power outputs. The projects in California, at Niagara and in the South have been especially noteworthy.

With the improvement in steam plant practice and the water power developments holding the center of attention at this particular moment, industry is asking several questions: Are these developments the ultimate? Will the power of the future be steam and water power? Will the en-

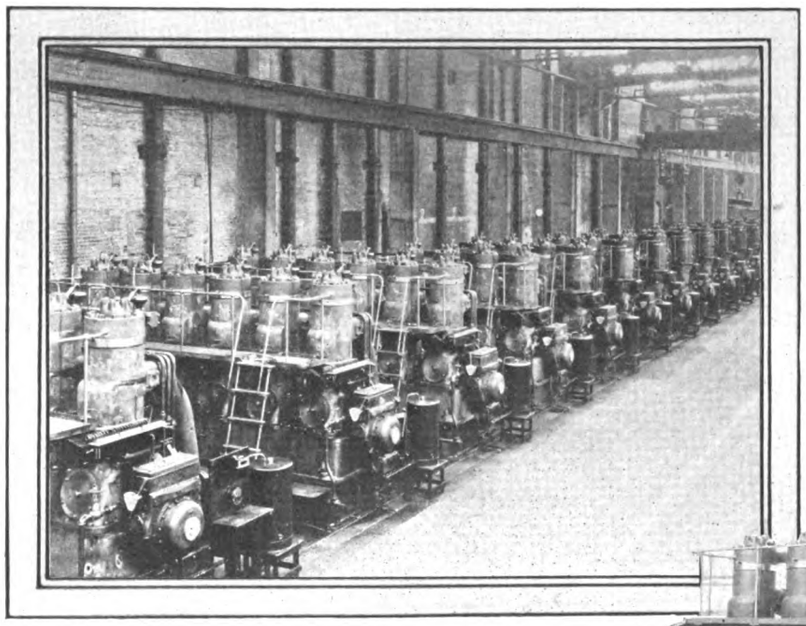


Fig. 1. Diesel engines undergoing test in the manufacturer's testing department.

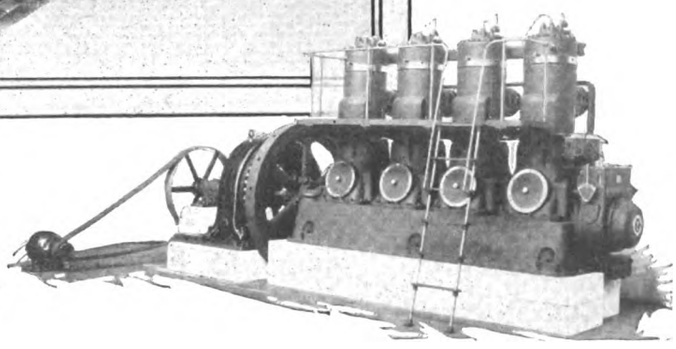


Fig. 2. At the right—a direct-connected engine and generator unit, with belt-driven exciter.

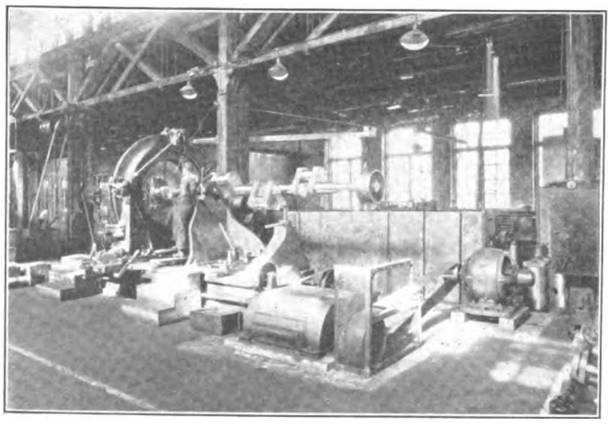


Fig. 3. Finishing wrist-pins on the crank shaft of a 300 hp. Diesel engine.

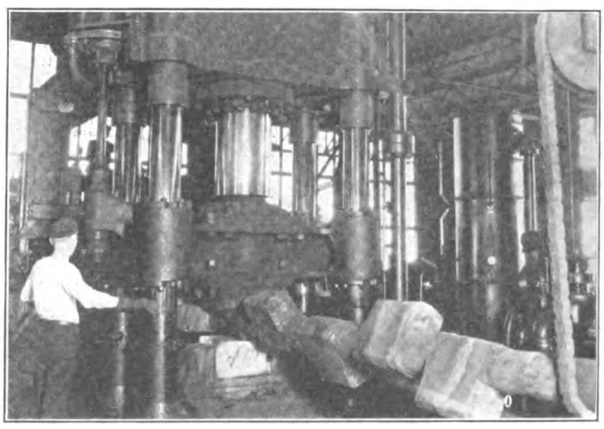
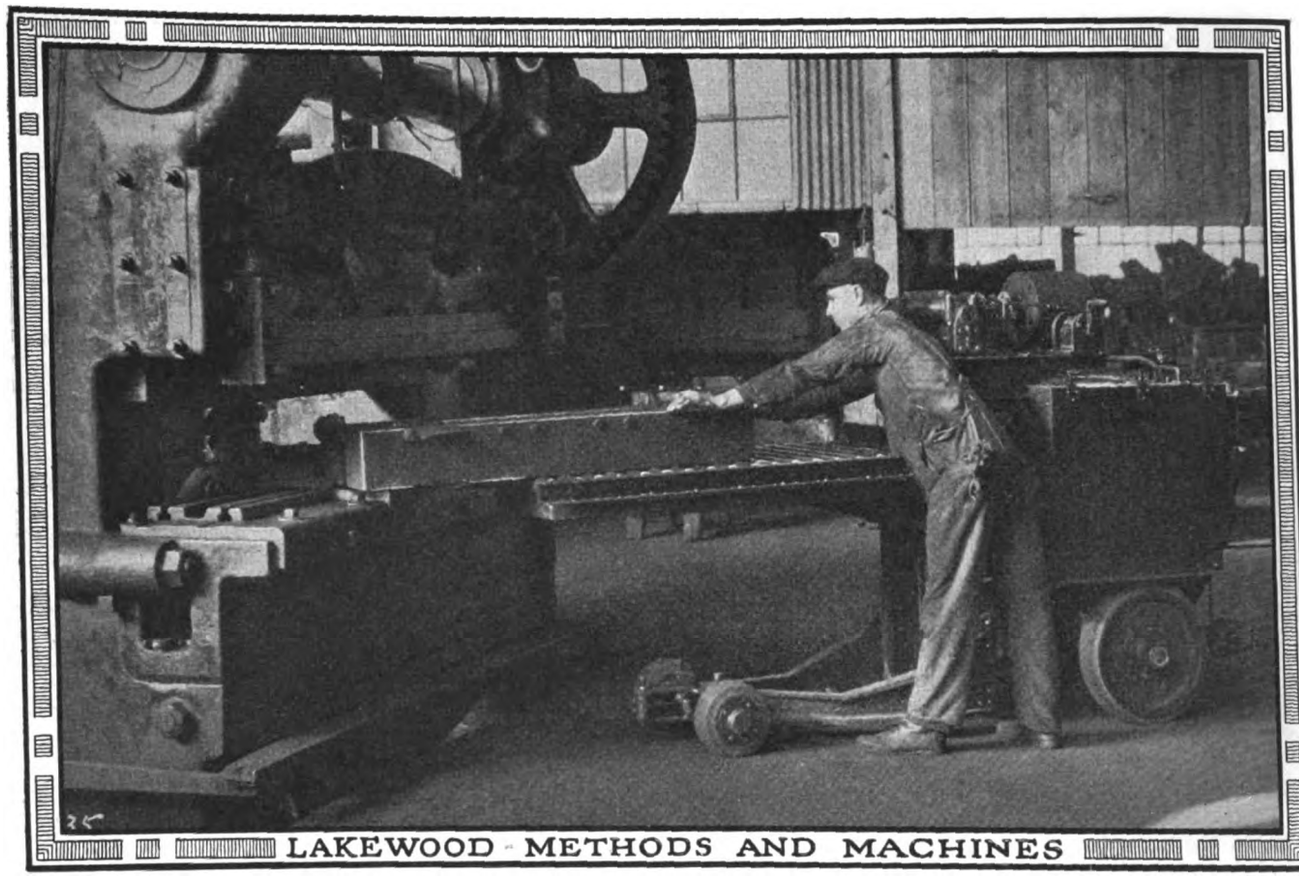


Fig. 4. A 1,000 ton hydraulic press forging a large Diesel engine crank shaft.

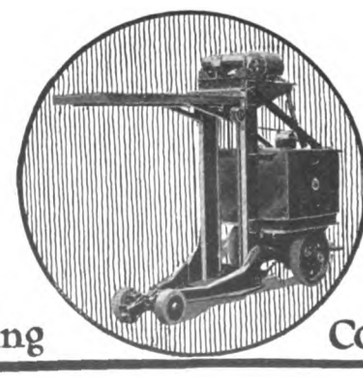
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tire nation be tied together with a huge power net work? What about the oil engines that we are hearing about?

In spite of the improvements in steam plant practice and in spite of the strides which have been made in water power development, the progress of the Diesel oil engine is little short of phenomenal. Like an irresistible tide it is breaking down barriers and finding a field of application which covers not only the seven seas, but the continents of the world.

With all of the attention which steam and water power developments have been given, what factors might be cited to account for the rapid increase in appli-

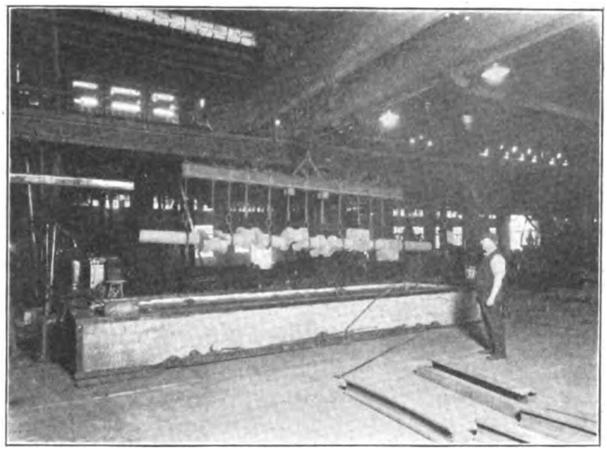


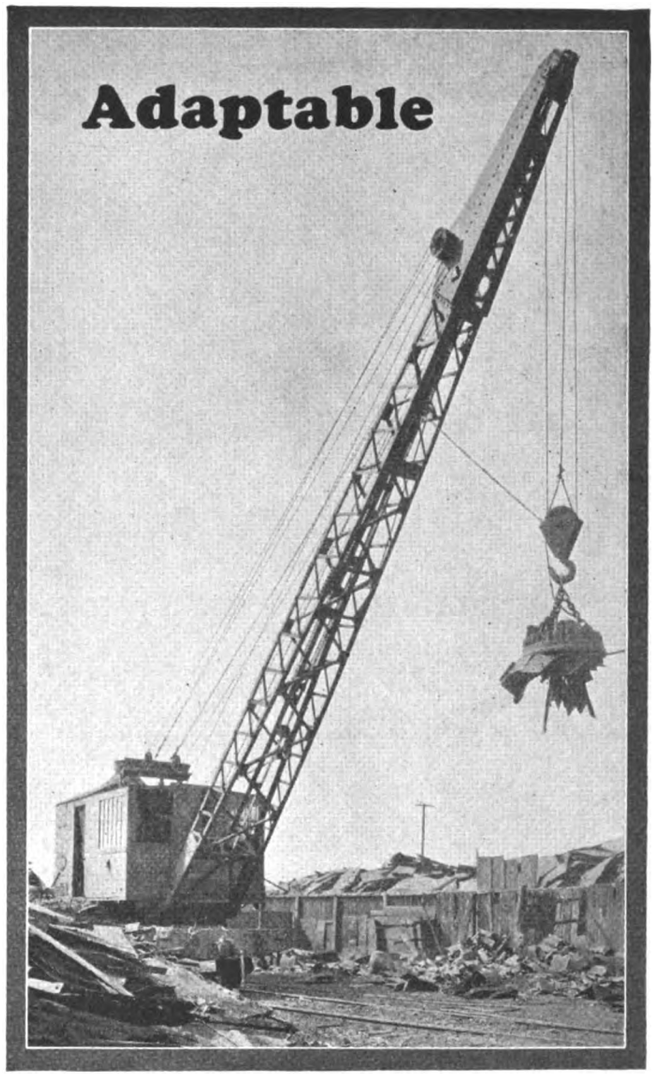
Fig. 5. How a massive crank shaft is quenched.

cations of the Diesel oil engine? This prime mover is to be found in almost every industry in both stationary plant service and in such applications as require a certain degree of portability such as shovels, dredges, locomotive type cranes and similar service. With the keen competition of huge steam and waterpower plants there must be, and there are, certain reasons for the growth.

One of the first reasons for the application of Diesel oil engines is its thermal efficiency. Engines of this type operate at a thermal efficiency of about 32 per cent., which means that utilization of heat is more effective. It is also interesting to note that this economy of fuel is practically the same for a 50 horsepower engine as it is for one rated at 5,000 horsepower. This high efficiency in all sizes means that the small industry has at its command a prime mover which is much more efficient than the largest super power steam station ever built.

Operation of a Diesel engine is quite different from the automobile engine. Fuel oil is injected into a combustion chamber about the time the piston has nearly reached the upper dead center. Due to the compression pressure of about 500 lb. per sq. in. the temperature of the entrapped air rises to about 1,000 degrees Fahrenheit and ignition of the fuel charge begins. As combustion proceeds, the burning gases expand through the orifice and combustion is completed in the cylinder proper. No explosion takes place and there is no rise in pressure, for the gases burn evenly and the expansion is quite similar to steam.

As the piston is driven downward on the power stroke, it first uncovers the edge of the exhaust port and the pressure in the cylinder drops to practically that of the atmosphere. The air inlet port is then uncovered and the air, which has been slightly compressed in the crank-



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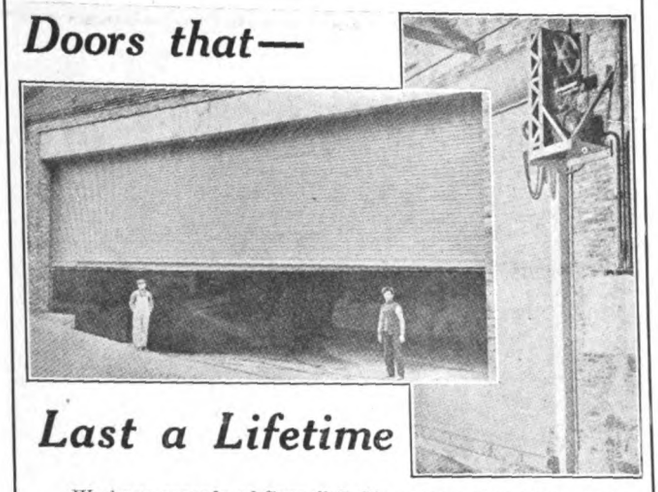
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The modern Cornell Rolling Doors, with motor drive for large units, are now in use everywhere. Fire doors labeled by Underwriters' Laboratories, Inc.

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Established 1846
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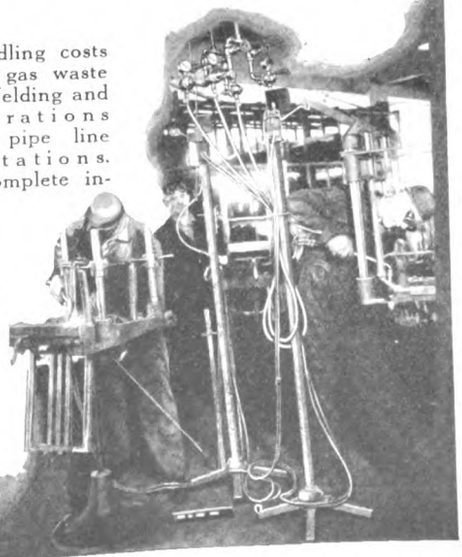
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case, due to the downward stroke of the piston, rushes out through the cylinder, blows out the burned gases and fills the space with fresh air. On the return stroke, the piston draws in another charge of air through the valves in the crankcase, and, as the air inlet port to the cylinder has again been covered up by the piston, the air remains in the crankcase until again compressed by the piston on the down-stroke.

This type of Diesel oil engine is known as the two-cycle, solid injection type. In this type there is a power stroke at every revolution.

In some types of Diesel oil engines the fuel is injected directly into the cylinder with the aid of compressed air at about 1,000 lbs. pressure. There are many arguments advanced as to the relative merits of the two systems, but such a discussion has no bearing on the subject at hand.

From the foregoing brief description, it will be seen that the Diesel is an extremely simple engine and that it requires no unusual skill to operate it. The engine starts with compressed air and when started is extremely dependable in operation.

In the early days of Diesel engines, some failures were experienced due to mechanical imperfections and poor design. The cost of the earlier engines was much higher than it is today because of the inability to supply modern production methods to the work. Vast strides have been made in improving designs and in the refinements used in building Diesel oil engines. As a result, breakdowns of high grade oil engines are as rare as turbine or water wheel failures. In fact, the improvements in Diesel engine practice might be likened to the improvements in the automotive industry.

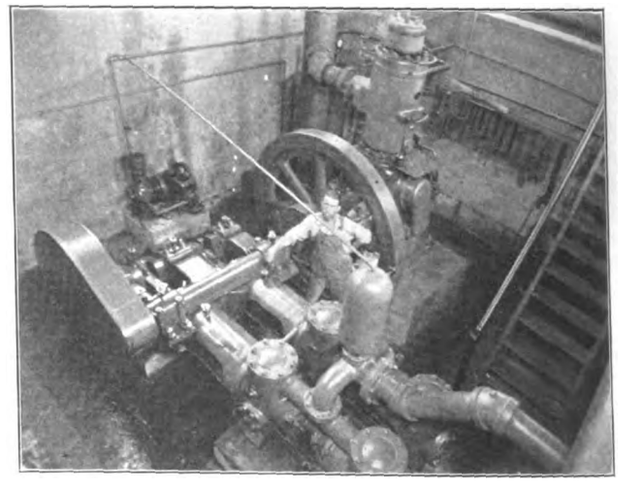


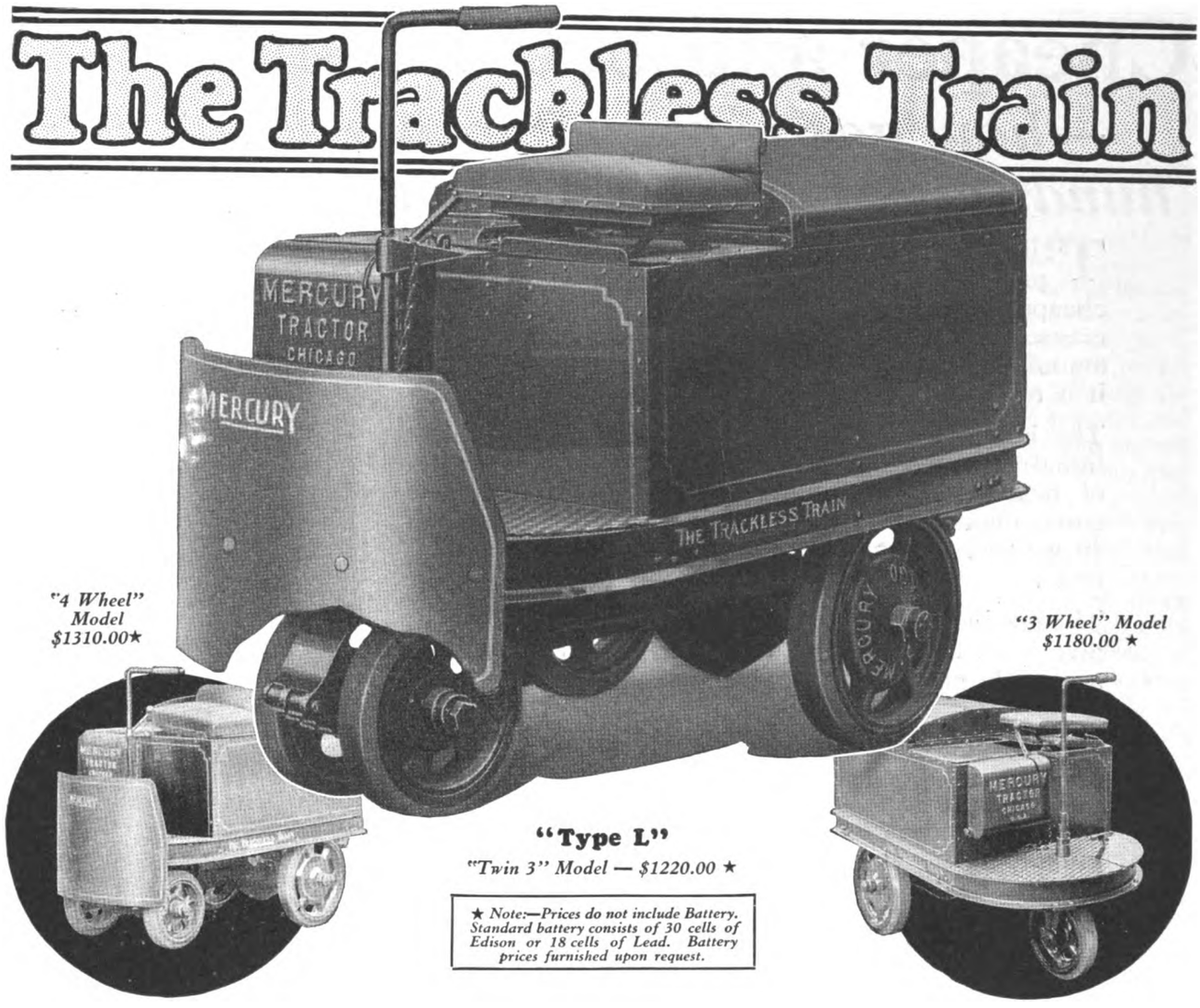
Fig. 6. A Diesel-operated pumping installation in Iowa.

Due to these improvements, costs have been reduced, and it is now possible to install a Diesel oil engine plant at a cost of from $125 to $150 per kilowatt of capacity, which is less than the cost of a modern steam plant.

Fuel economy, improved dependability and lower first cost, together with low attendance charges, means that the Diesel oil engine plant can, and is, producing power at costs which are in line with production costs of the largest and best steam plants. Since there are no distribution costs to be added and the profits go into the treasury of the industry, it is easy to understand why the Diesel oil engine is taking its proper place.

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THESE days of narrow profit margins it is often cheaper and easier to increase profits by improving manufacturing methods than it is to increase sales.

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How to get these benefits

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The design of metal recuperators for coke ovens which have greatly lessened the cost of construction.

The developing of the most efficient method of cleaning coke oven and producer gas.

The developing of instruments for recording the heating value of gases.

The designing and constructing of clean producer gas plants in which gas is made from bituminous coal, anthracite, coke, charcoal, and lignite, distributed like city gas for use in metallurgical furnaces, ovens, kilns and engines.

The converting of hot producer gas plants to clean cold producer gas plants, and extending the utility of producer gas to many refined heating operations where accurate control of processes is necessary.

The creation of methods of utilizing cheap gas of low heating value as efficiently as gas of high heating value.

The developing of apparatus for the efficient production of fuel gas from low grade lignite, wood refuse, sawdust, shavings, etc.

The developing for the Delco-Light Company of a thoroughly practical and highly efficient gas producer of very small size for operating farm lighting units in those countries where liquid fuels are very expensive.

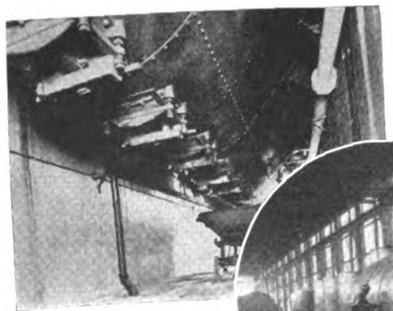
During the last three years work of this character has been done for such well-known concerns as the following:

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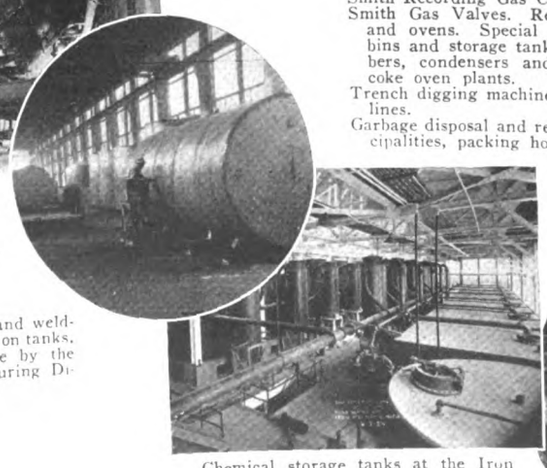
Smith Gas Engineering Co., Dayton, Ohio

The Smith Gas Engineering Company (Manufacturing Division) manufactures the following equipment:

Smith Gas Producers for bituminous coal, lignite, coke, charcoal, semi-anthracite and anthracite.
Tar extractors for coke oven and producer gas.
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Smith Gas Valves. Recuperators for furnaces and ovens. Special gas furnaces. Bunkers, bins and storage tanks of every kind. Scrubbers, condensers and coolers for by-product coke oven plants.
Trench digging machines for public service pipe lines.
Garbage disposal and rendering plants for municipalities, packing houses and the like.

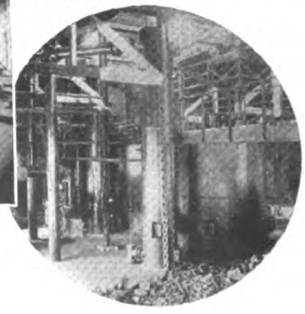


Ash bunker designed and manufactured by the Manufacturing Division of the Smith Gas Engineering Co.



Riveting and welding seams on tanks, work done by the Manufacturing Division.

Charging floor of 3 type "F" Smith Gas Producers, products of the Manufacturing Division.



Chemical storage tanks at the Iron Mountain Plant of the Ford Motor Co. The Manufacturing Division has fabricated 73 tanks for this concern.

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Why Painting Is Advisable for Surface Protection

By Roy C. Sheeler

THE increasing use of concrete and cement in the construction of industrial buildings has proved beyond question the important place these materials fill today. When properly constructed, these surfaces possess unusual strength and durability. Their life varies with the type of construction, and, which is equally important, the degree of protection they receive from the action of the elements. It seems to be the popular conception that concrete requires no protective coat; that it in itself combines those features of strength and permanency without assistance. And to a certain degree this is true. All have seen instances where concrete structures have stood for years without protection of any kind and are apparently in as good condition as when first erected. On the other hand, instances innumerable occur wherein the surface first begins to show minute hair lines and cracks, which, gradually expanding, grow larger and larger and finally, the surface is disintegrated and the entire structure weakened. This condition is probably due to the manner in which the concrete is poured. The mixtures of aggregate, sand and cement were not carefully balanced. But the owner of a concrete building is hardly in a position to determine whether his structure was properly constructed or not. Only a period of years will bring out any inherent weakness in construction methods. So it is well to be on the safe side and give these surfaces the protection they need for long service.

Concrete and cement are always more or less porous. They absorb great quantities of moisture. The consequent expansion and contraction causes small cracks to appear. These gradually enlarge and offer still further opportunity for the penetration of water. During the winter season this moisture freezes and expands, producing still larger crevices. Chipping and breaking down of the entire surface may then occur.

The average concrete and cement surface is considerably different from most other paintable surfaces and therefore requires different treatment. Much of the dissatisfaction arising in the attempt to paint these surfaces is due to ignorance of their peculiar characteristics. The very nature of the materials used in their preparation call for a careful pre-treatment in most cases. Concrete and cement always contains more or less free lime in its makeup. Lime is an alkali, and if permitted to come in contact with an oil paint, will quickly convert the oil into soap—exactly in the same manner that soap manufacturers bring fats and alkalis together in making their finished product. Rain and moisture quickly dissolves the soap and nothing but the pigment remains.

The most successful pretreatment is the application



Fig. 1. A test panel covered with a single pigment paint made with pure linseed oil. While the condition is good, the surface is darkened.

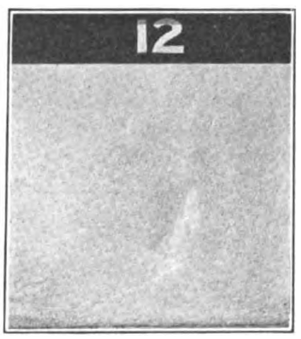


Fig. 2. Panel covered by a combination paint made with a mixture of raw and bodied oils. Condition excellent.



Fig. 3. Scaling and surface disintegration, due to the use of paint containing acid resins.

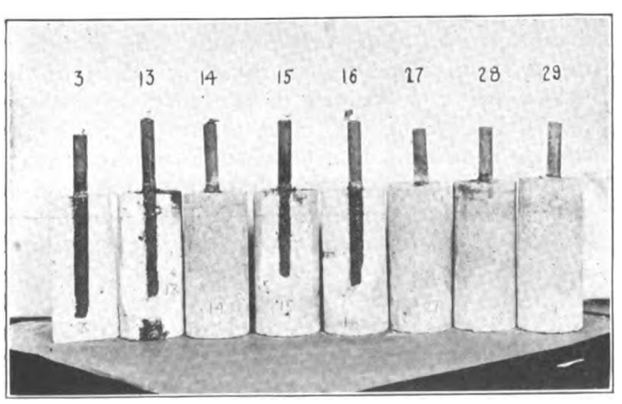


Fig. 4. The painted rods in cylinders 27, 28 and 29 were "sanded." These show excellent conditions.

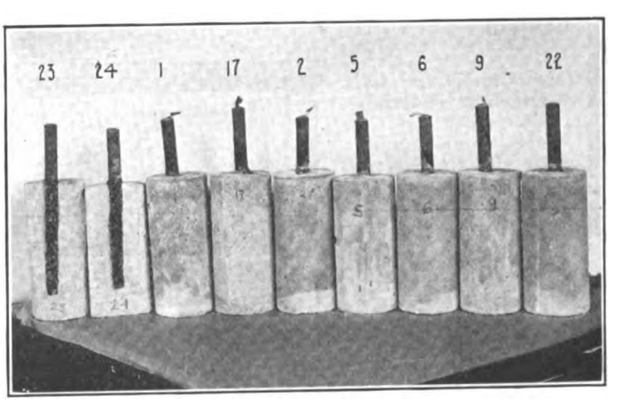
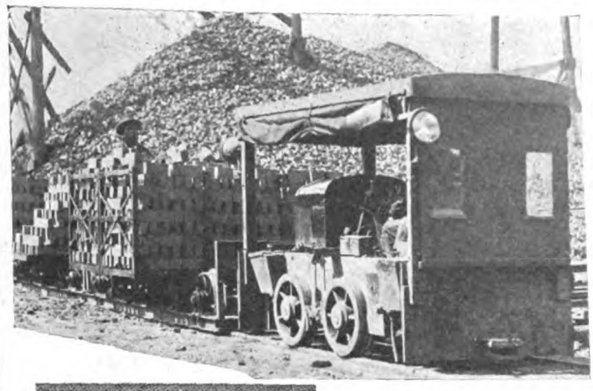


Fig. 5. The uncracked cylinders contained rods first coated with lacquer paints and special oils. Those numbered 23 and 24 were unpainted.

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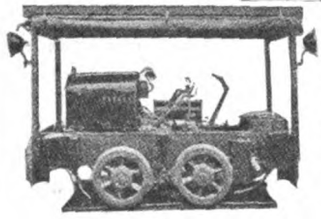


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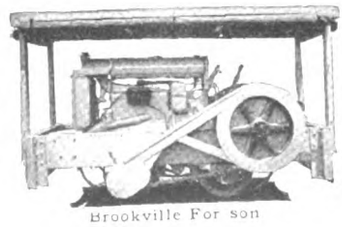
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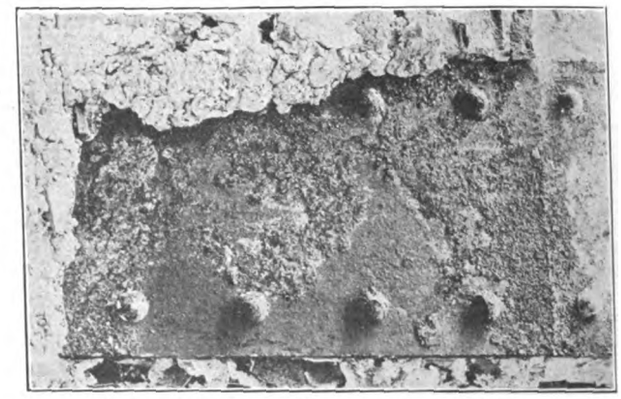


Fig. 6. Here is evidence of the real danger of failure properly to protect steel work which is to be embedded in concrete.

of the sulphate of zinc wash. This wash is made by dissolving three pounds of sulphate of zinc in a gallon of water. Apply with an ordinary bristle brush when the cement or concrete is dry. Allow at least 48 hours for the wash coat to dry, longer if possible. Then go over the surface with a stiff brush to remove any crystallization which may be present. The surface then is in proper shape for painting with little if any chance for later trouble with the paint coats.

Another most important characteristic of cement and concrete surfaces is the unequal absorption qualities of the surface. Such surfaces are always more or less porous so that any paint coat applied to them will dry with a spotted or unequal finish. It is extremely difficult to tell beforehand just how much porosity there may be in a given surface. Furthermore, due to this fact, a paint that spread over 400 sq. ft. of surface on wood, would not spread more than 300 sq. ft. on concrete that was not treated for its porosity. The sulphate of zinc wash reduces the porosity to a considerable degree. But not all surfaces are given this treatment, so that for best results, it is almost a necessity to give the surface a coat of some material that will fill the pores and permit the subsequent coats of paint to dry uniformly and evenly. There are a number of products on the market, of much the same general character, which may be used for this purpose. They are clear, colorless liquids which may be applied by brush or spray. One application is usually sufficient.

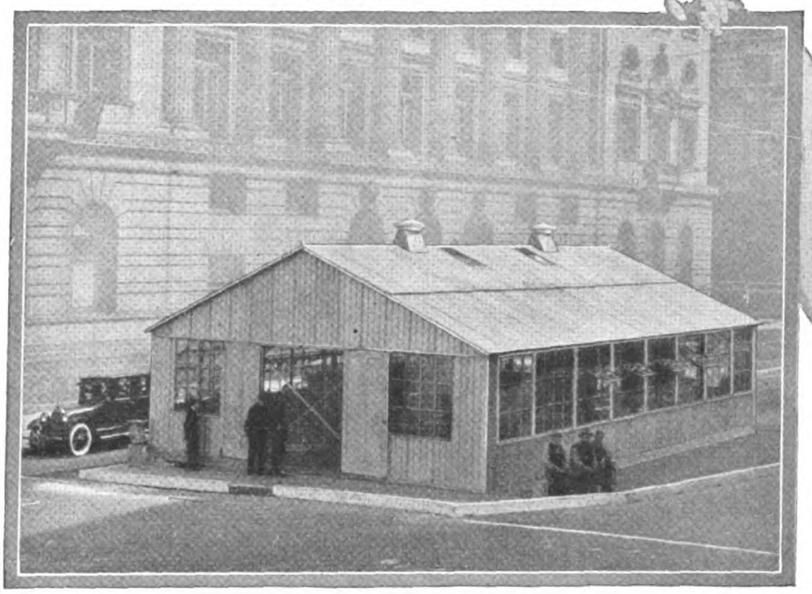
A series of tests conducted by the Institute of Industrial Research at Washington, D. C., proved conclusively that the combination-pigment paint, composed of white lead, white zinc or similar pigments, ground in linseed oil or other treated, water-proofing oils, is the best paint to use on concrete and cement surfaces. Many of the successful stucco or concrete paints today dry with an eggshell finish. Generally, however, any of the paints which give good results on wood surfaces may be used with equal satisfaction, provided the preliminary work has been done in preparing the surface for painting.

One of the great difficulties in painting the exterior of a concrete or stucco surface is the roughness of the texture. This is extremely hard on good brushes, as well as a difficult matter to get the paint properly applied to all parts of the surface. For that reason, the application of the paint by means of the spray machine is particularly appropriate.

The widespread use of reinforced concrete in building construction today brings us face to face with the im-

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In 1904, the present Baltimore plant of the Blaw-Knox Company was established and, through increased facilities for manufacture, the all-metal building became more widely known.

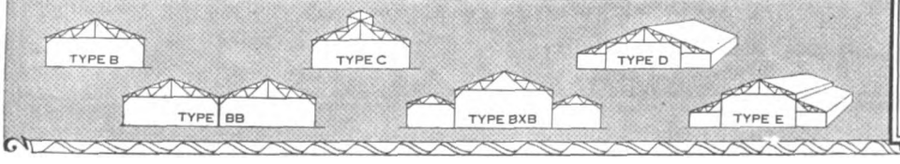
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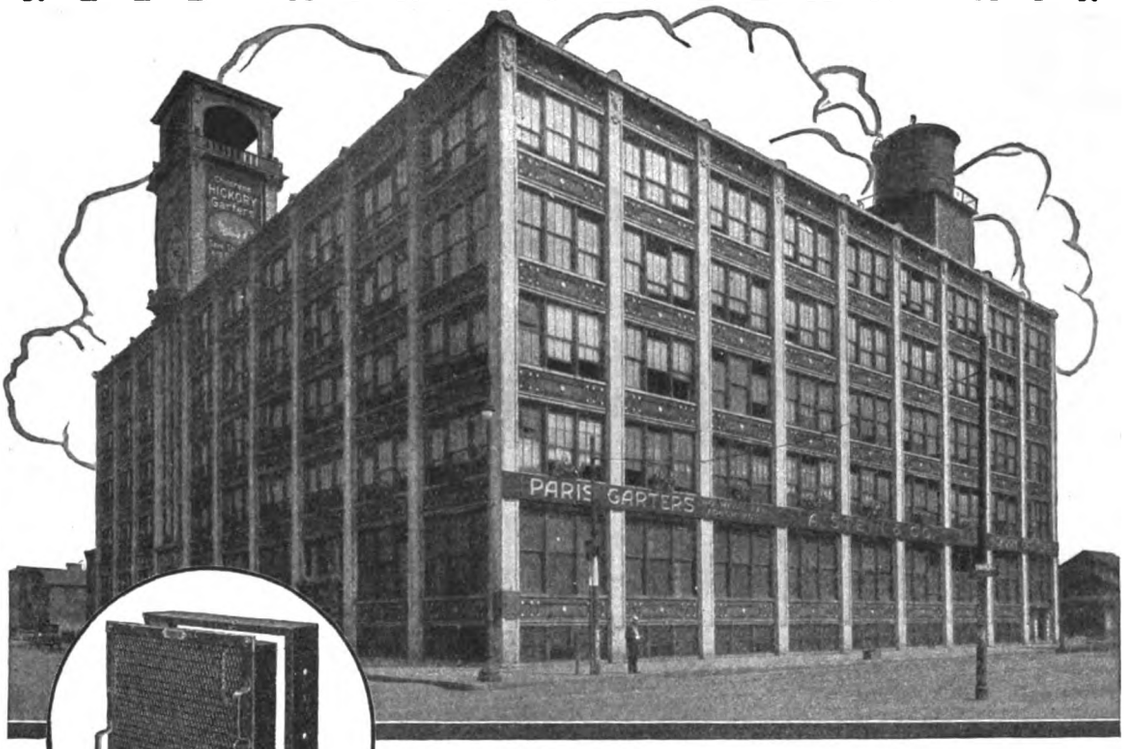
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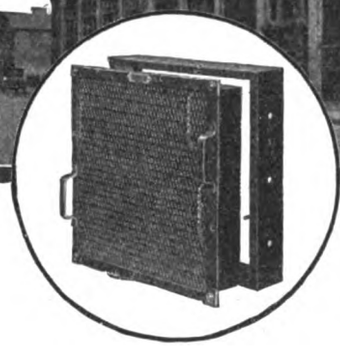
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portance of a consideration of this problem and its correct solution. There is a wide divergence of opinion on this point. But all the facts available seem to indicate the presence of accelerated rust and corrosion on steel and iron reinforcements, with its train of serious consequences. It follows that if for any reason, the life and strength of these reinforcements is impaired, the stability of the concrete structure itself suffers accordingly. The forces which attack steel reinforcements are the same as those which assault other steel or metal surfaces--namely, rust or corrosion and electrolysis.

On first thought it would seem that a paint that would be highly resistant to the conduct of electrical currents would be a very efficient paint for such surfaces. Such films, however, generally dry with a high gloss surface, and in so doing would prevent the proper bonding of the concrete with the painted metal, thus doing more harm than good. Dr. Gardner, of the Institute of Paint and Varnish Research, has conducted tests in which steel rods, embedded in concrete, were painted with various combinations and connected with an electrical current for a certain length of time. These experiments proved that a paint that dries with a flat or semi-flat finish offers a better bond between the concrete and metal. In all cases, sufficient time should be permitted for the paint film to thoroughly dry before pouring the concrete. The pigment portion of this paint should be a non-conductor as well as a rust-inhibitant. The vehicle should be composed largely of heavy-bodied or treated oils, which dry with a flat rather than a gloss finish and that are resistant to the effect of contact with the alkali in the concrete.

Finally, painting the surface of the concrete in which steel reinforcements have been used will tend to keep the interior of the concrete dry and thus retard, if not altogether prevent the absorption of moisture, which is the contributing cause to serious corrosion of these reinforcements and subsequent weakening of the structure. It will thus be seen that the application of paint not only preserves the concrete itself from disintegration, but at the same time prevents much more serious damage to the steel skeleton on which the strength of the structure depends.

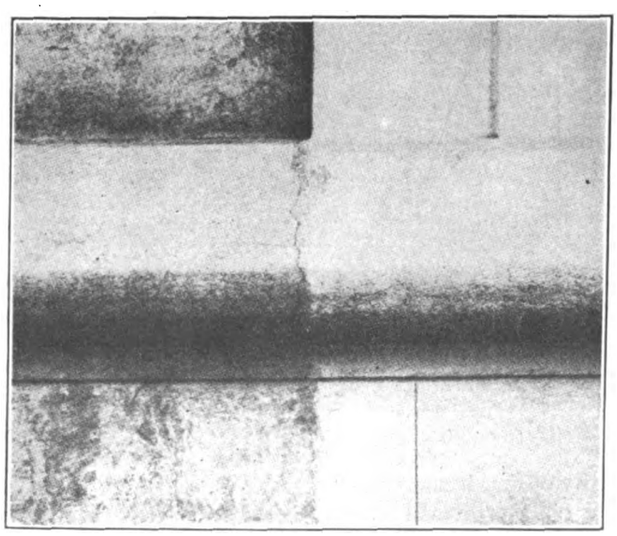


Fig. 7. Note the large crack in the unpainted portion of this stucco building. Many small fissures are evident on the original photograph, but do not show in the reproduction.

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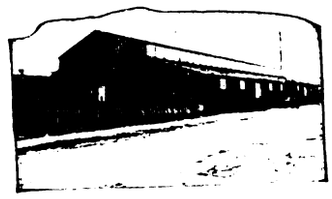
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Fig. 1. The soil is a heavy loam, streaked with clay, and strewn with rocks.

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Fig. 2. For the bridge approaches, it was necessary to rip out building foundations, pipes and so on; a tough proposition for any shovel.

This gasoline shovel is thus proving its own worth in this tremendous job of moving some 100,000 yards in really tough digging.

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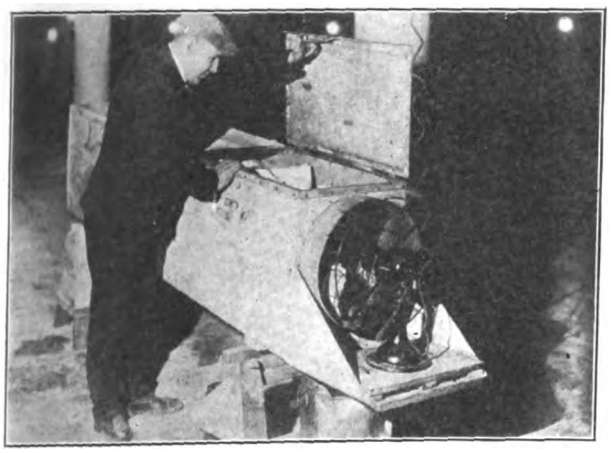
Controlling Humidity in a Storage Warehouse

By George F. Paul

HIGHLY satisfactory results are being obtained in one of the big Chicago cold storage warehouses in controlling the humidity through the use of galvanized iron containers in which large quantities of calcium chloride are placed.

The quality of eggs, for example, is affected by the humidity of the atmosphere. If the air is too damp, the eggs will absorb moisture from the strawboard fillers that they are packed in, and this will produce an undesirable flavor. There is an equal danger from an atmosphere that is too dry. In that case the eggs will shrink too much and take on a stale taste.

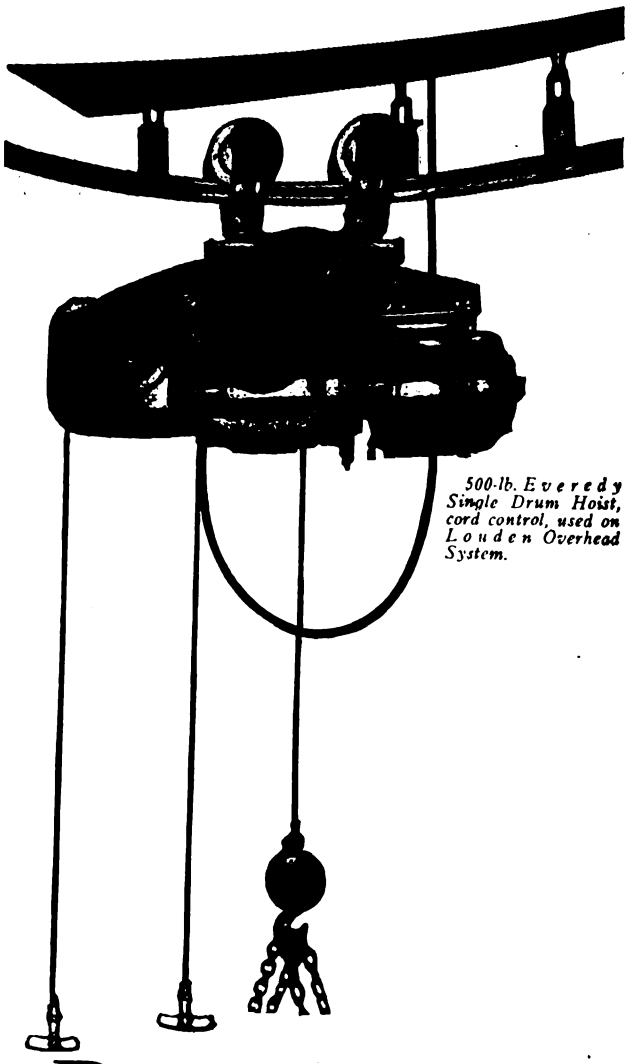
Calcium chloride has the property of absorbing moisture from the air. This property has been utilized to good advantage in planning a system to remove the humidity prevailing in the big storerooms. Several galvanized iron boxes are used in each room. Each box is 10 feet long, 18 inches wide, and 22 inches deep. The ends are left open and the hinged lid is in three sections. It is strengthened with iron straps.



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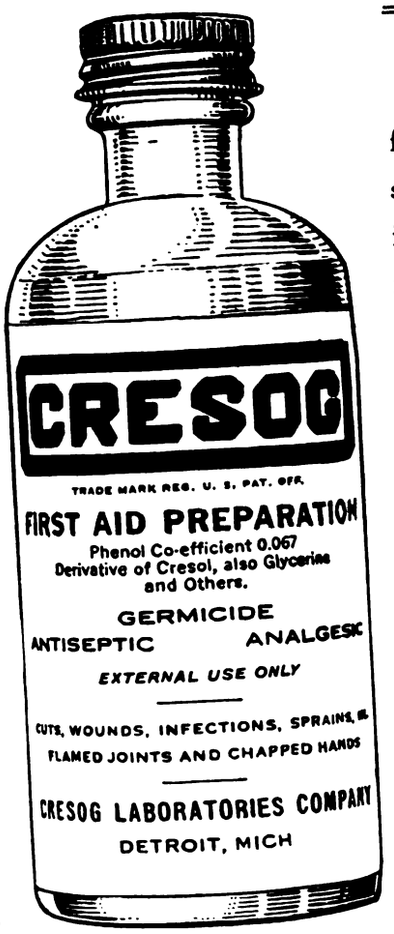
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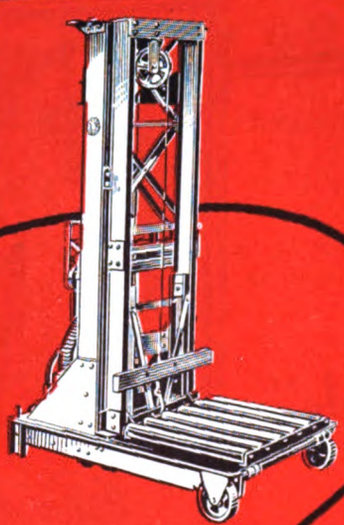
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THE first thorough cleaning with an "INVINCIBLE" Portable Vacuum Cleaner saved The Schwarzenbach-Huber Company, West Hoboken, N. J., $560.00 in cleaning labor alone. This more than paid for the machine. Never before had the mill been so clean. All walls, ceilings, overhead pipes and shafting, as well as floors and machinery, were absolutely clean.

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Invincible Vacuum Cleaner Mfg. Co.

Dover, Ohio.

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Tumbling Room Economies

Taking Haphazard Methods Out of a Difficult Department

By Arthur L. Greene

SHOWN below are photographs of a compact, noiseless, and dirt-free tumbling arrangement used at the plant of the Buffalo Bolt Co., at North Tonawanda, N. Y. The efficiency of the arrangement is easily appreciated when it is said that within this small tumbling apparatus are contained nine tumbling barrels having a total capacity of 150 tons of material daily. This is not the only feature of importance, however. To be noted, in addition, is the ease and efficiency with which the material is handled, the arrangement of the control mechanism which is so perfected that it can be said to operate with the nicety and quickness of automatic machinery, and the small force of men needed for operation.

It is the intention to describe here only the salient features of this apparatus. The total space occupied is approximately 18 x 30 ft. In front of and to the right of the apparatus (Fig. 1) will be noted a small weighing room. The scale platform itself is outside the room. On this, all bolts and nuts are weighed as they come from the tumbling hoppers and before being taken to the various departments for the finishing work. The scale operator checks the tonnage delivered by each man. At the end of the week, the "wheeler," as he is called, is paid on a pro rata basis per tons hauled. Passing through an opening in the center of the tumbling mill will be noted a narrow gauge track. Small trucks enter here and remove the scrap metal from the hoppers located directly alongside the track. Overhead is a large crane hoist, operating the entire length of the building, and at one end of which the tumbling mill is located. This crane delivers the bolts and nuts to the upper deck of the tumbling mill. Here they are tipped and emptied into a funnel shaped car (3′ x 5′ x 28″ deep) by the deck operator.

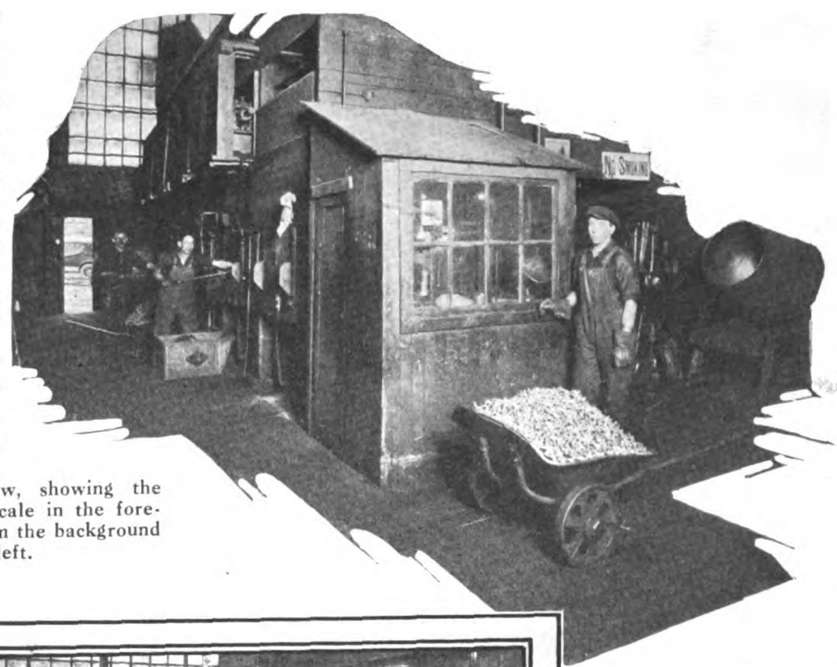


Fig. 1. General view, showing the weighing room and scale in the foreground, and hoppers in the background to the left.

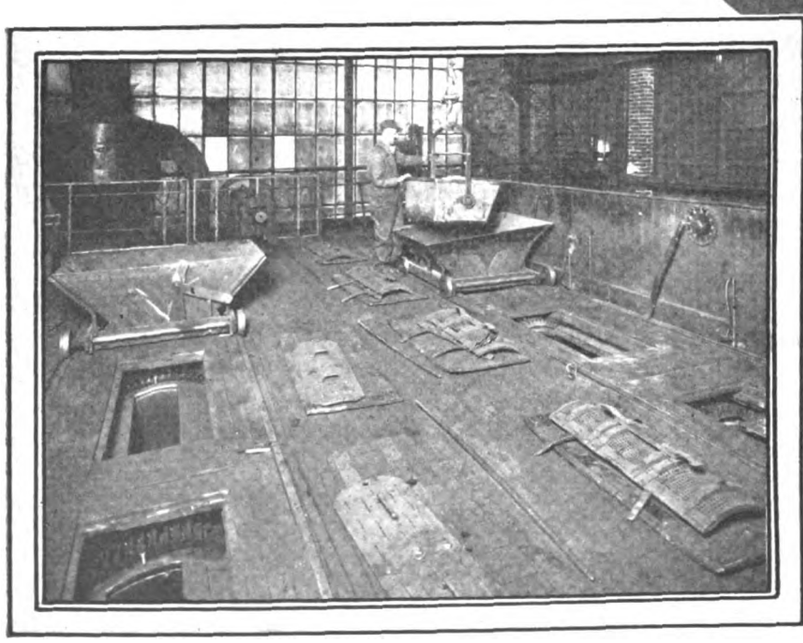


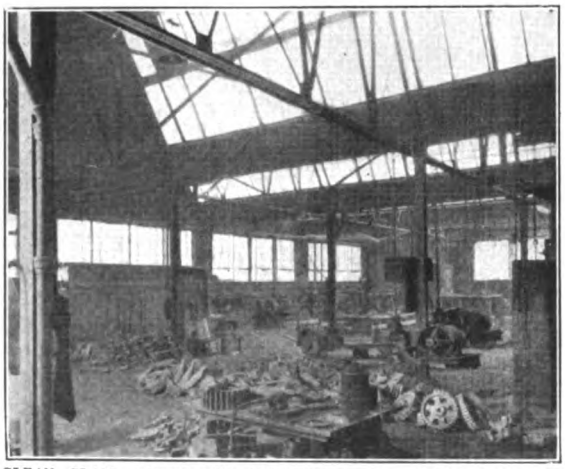
Fig. 2. The upper deck of the tumbling mill, where overhead crane delivers the stock to be dumped into tumbling barrels.

A study of the layout of this deck (Fig. 2) will well repay the executive experiencing production troubles with his tumbling department. It will be noted that on both sides of the deck is a track, on each of which runs one of the funnel cars just mentioned. Further examination of the deck layout will now reveal a series of trap doors placed one in front of the other and inside the track. On the right hand side of the deck are five of these doors, while on the other side are four, making a total of nine doors. Directly under each door is a tumbling barrel; these are placed end to end and in a horizontal position. Each barrel runs in its own bearings and derives its motive power from a countershaft located alongside to which it is con-

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DIRTY GLASS. ½ of 1 foot-candle illumination. Even with 14 electric lamps, only 2 foot-candles (on a bright day). (This photo required an 18 minute exposure.)



CLEAN GLASS (cleaned with SKYBRYTE). No artificial light. 38 foot-candle illumination—19 times more! (This photo required less than 1 second exposure.)

SKYBRYTE made this Astonishing Difference

Flooding this Dark Interior with Daylight

THE vivid difference between these two contrasting photographs of the Conveyor Chipping Room at The OTIS STEEL CO., Cleveland, O. (Lakeside Plant), is a more eloquent sales argument for SKYBRYTE than anything we could say.

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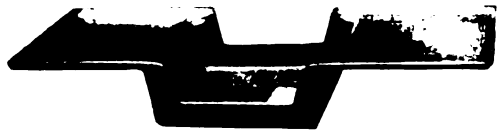
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nected by a series of three intermediate gears. These gears are engaged or disengaged by means of a lever projecting above the deck floor, as shown in the photograph. Under each barrel is a unique arrangement providing for the disposal of the tumbled material into one hopper or bin, while the scrap material is deposited in another. It is essential, of course, to keep the scrap separated from the finished stock. In short, each tumbling barrel is provided with a pair of hoppers—one for the stock and one for the scrap material. The pair of hoppers are placed back to back on the floor below—that is, the scrap hopper or container fronts the narrow gauge track passageway, while the stock container faces the outside passageway. Placed above and midway between each pair of hoppers is an upright, heavy gauge piece of sheet metal. This steel plate and its operating mechanism is so designed that it swings from a pivot directly at the top of each pair of stock and scrap hoppers. By pulling on one of the two cords, the plate is swung under the revolving barrel so that the fine pieces of scrap metal, shaken free of the stock by the tumbling action of the barrel, are directed into the scrap hopper; by pulling on the other cord, the plate is swung to the opposite side so that the stock itself, upon completion of the tumbling operation, is directed into its own hopper. The stock and fine scrap material, each in their own hopper, are now ready to be removed. The deck operator indicates to the "wheeler" (meaning the man who removes the material to the various departments) which hoppers are full and ready to be emptied. The door in front of the bin is raised, the stock or scrap material, whichever it may be, falls out into the wheelbarrow placed under the opening, the "wheeler" weighs the material on the scale in front of the tumbling mill, and then conveys it to the designated department. When the hopper or hoppers are emptied, the deck operator is notified and new stock is then tumbled. All nine barrels, with their stock and scrap hoppers, are kept employed in this way throughout the day by one deckman. He takes care of emptying the buckets of material into the funnel car, the emptying of the material into the barrel for tumbling operations, fitting of the covers on the barrels after filling, starting and stopping the barrels, gauging of the time necessary for tumbling a certain sized stock, removing the barrel covers, and emptying the material into the hoppers. The scrap material falls from the barrel through finely gauged openings and into the scrap hopper during the tumbling operation. The deck operator, like all others employed at this kind of work here, is paid on a pro rata tonnage basis of bolts and nuts tumbled.

To revert for a moment to the operations performed and the mechanical devices used in filling the tumbling barrels. The crane operator raises a bucket of bolts or nuts (the buckets themselves are standardized—that is as to size and style) to the tumbling mill deck. The deck operator removes the trap door over one of the empty barrels, takes off the barrel cover and then runs the funnel car over the opening. The crane carries the loaded bucket over the car and the deck operator tips the load into the funnel car. By means of a lever on the side of the car, the shutter bottom is released and the material falls into the barrel. It is worth noting here, incidentally, that this shutter bottom is so designed that it fits exactly into the barrel opening; thus none of the stock is lost in filling the barrel.

Seamless Kantainer



No Seams
No Rivets
No Joints

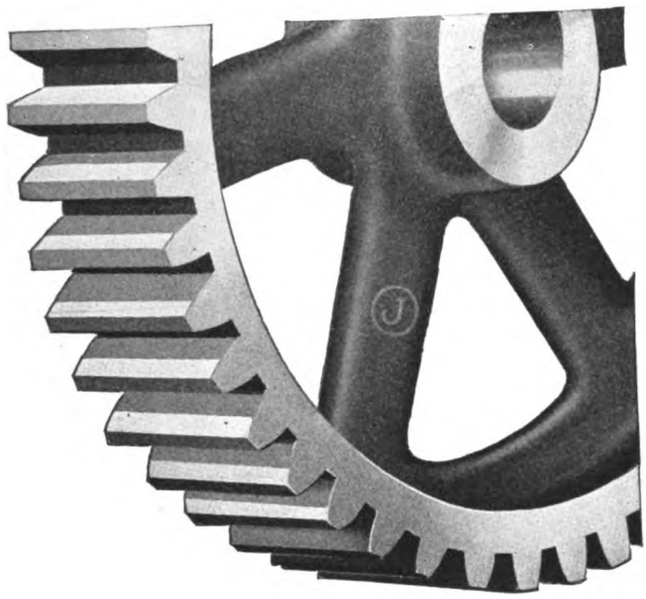
Pressed from a circle of cold rolled steel—cannot crack, break or leak. Will give many years' service.

Every industrial plant where a Seamless Kantainer has been tried has adopted them for use throughout the plant—for handling parts, small castings, oil drip, waste and other uses.

Ask for list of satisfied users· The Norton Co., Worcester, Mass. have 5200 in use. Comes in 5 sizes. Send for one for *any service* and we will send it on. Free trial for any period you may designate.

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STURDINESS and accuracy are primary factors in good gears—of any kind in any material.

These you will find always in Jones Industrial Gears—expressive of the highest ideals in engineering practise.

A copy of Catalog No. 30 should be on your desk. You will find much usable information in it. Write for it. There is no charge.

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Industrial Gears

The funnel car is now pushed aside, the barrel lid replaced and tightened down by two bolts, and the trap door put back over the opening, thus making a solid deck floor again. The gears are engaged by throwing in the clutch lever on the side and the tumbling operation has begun. In order to remind the operator that a particular tumbling operation is completed, there is placed on the side wall, directly opposite each barrel, a large time dial. The period for finishing any one run is indicated on the dial by the operator when beginning the tumbling operation. In this manner, a glance at the various dials will show when tumbling for each barrel is completed. Thus the greatest tonnage per day is assured by eliminating all lost time.

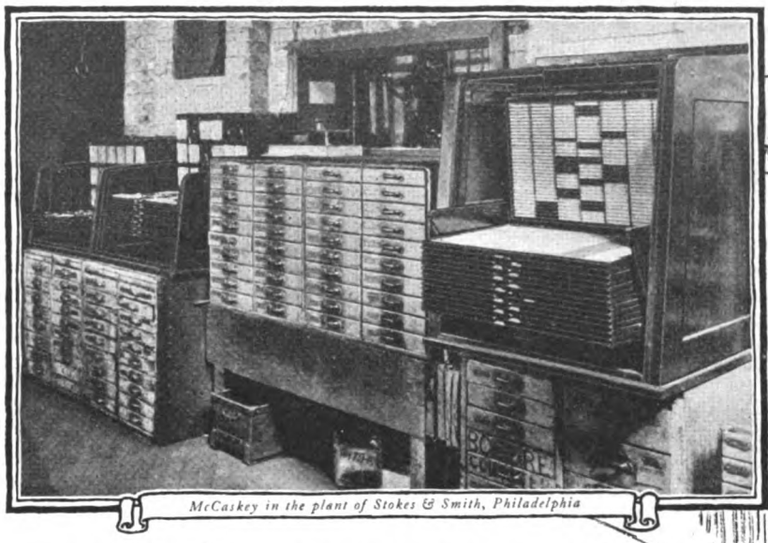
In tumbling bolts and nuts a quantity of sawdust is used with each barrel of material to produce a clean, polished article. A storage bin for the sawdust is placed in the left hand corner of the deck for this purpose. The barrels used are made of heavy gauge metal with small openings in the sides and cylindrical surface for freeing the scrap metal as tumbling proceeds. The bearings used here are extremely simple in design and were expressly designed for this purpose in order to facilitate removal of the barrels when cleaning or repair operations were necessitated. No bolts are employed. Outside oilers are used wherever possible for lubricating purposes. A thirty horsepower motor is used for driving the mechanism. The drive from the motor to the "jack" shaft is by pulley. From here the "jack" shaft drives two separate countershafts, one being on either side of the deck to drive the barrels.

The five barrels on the right hand side of the mill are of one size and will tumble one bucket-full of material at a time. The four barrels on the other side, however, are made larger, each being capable of taking care of three buckets of material at one time. In order to insure the utmost cleanliness around the mill, an exhaust ventilating system is used for positive removal of all dust. The main exhaust pipe leads through the track passageway to the exhaust fan located above and back of the mill deck. Leading at right angles from the main exhaust pipe are a series of small exhaust ducts opening directly under the tumbling barrels. For trucking the tumbled material to the various departments, a group of roller-bearing two-wheeled trucks are used. These trucks are perfectly balanced as well in order to reduce the physical exertion to the minimum.

The above represents, in brief, a tumbling mill in which the management has expended considerable constructive effort in reducing physical labor, time element and adverse working conditions. In doing this they have been repaid by increased output and reduced labor turnover. Thus we have illustrated another successful adaptation of the modern idea of placing work upon a production basis wherein the human element is replaced to a large extent by mechanical power.

After all, noise elimination, proper heating and ventilating, good lighting, space conservation and the reduction of labor turnover is within the power of all by the application of a little thought, time and money. The expense attached is more than repaid by the decreased labor turnover and the added output.

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McCaskey in the plant of Stokes & Smith, Philadelphia



RESPONSIBILITY FIXED
TOOL LOSS ENDED

"ABOUT two years ago," says A. W. Suessmith, Asst. Supt. of Stokes & Smith Co., Philadelphia, "we decided to put a stop to the constant loss of tools that was costing us considerable money, and causing a great deal of trouble.

"A McCaskey system comprising three cabinets was installed to handle our stock of about three thousand different items. This system has ended our tool losses. Now that responsibility is definitely fixed, the men take just as good care of tools drawn as they would of their own, and return them promptly.

"The McCaskey system helps us keep down our tool investment, by enabling us to put our hands on any tool at any time, and by eliminating loss alone has already more than paid for itself."

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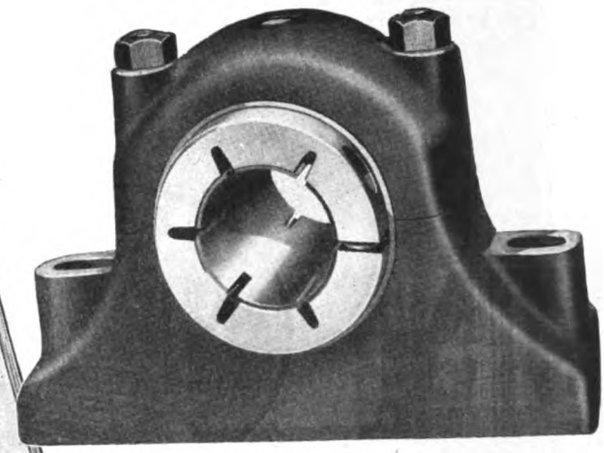
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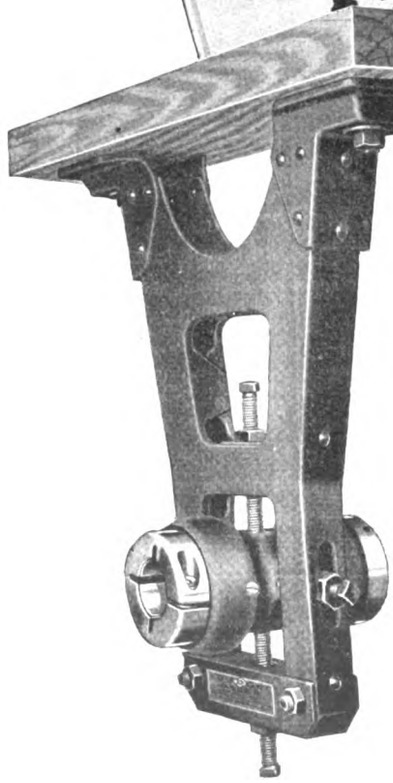
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Advertising Safety to the Employee

By R. T. Solensten

THE same advertising psychology which has stamped certain brands of flour, soap, automobile equipment, chewing gum and other commodities indelibly upon our national mind is now being employed to influence the American workman to avoid accidents—to sell him the idea that the industrial accident does not "just happen," but that it is caused, and that 75 per cent. of the cause is within the control of the employee himself.

One of the first safety bulletins to be used resulted from the electrocution of a young worker in the St. Louis plant of the American Steel Foundries, 1910. William H. Cameron, now managing director of the National Safety Council, then manager of the casualty department of the company, was called to the St. Louis plant to make an investigation of the tragic death. He did this and also attended the funeral of the sturdy young American workman. So obvious was the fact that the fatality could have been avoided and so painful was the experience of the funeral that Mr. Cameron hit upon the poster idea as a solution. He had 100 copies of the young man's picture made and these were mounted on cards bearing a brief statement of the accident and an appeal for the prevention of similar accidents. The bulletins or posters were sent to all the plants of the company, first to the executives, then posted for the benefit of the men. Since this pioneer safety bulletin millions of others have been published not only advertising safety but thrift, health, and other subjects important in the employer-employee relations of the highly complex structure of modern industry.

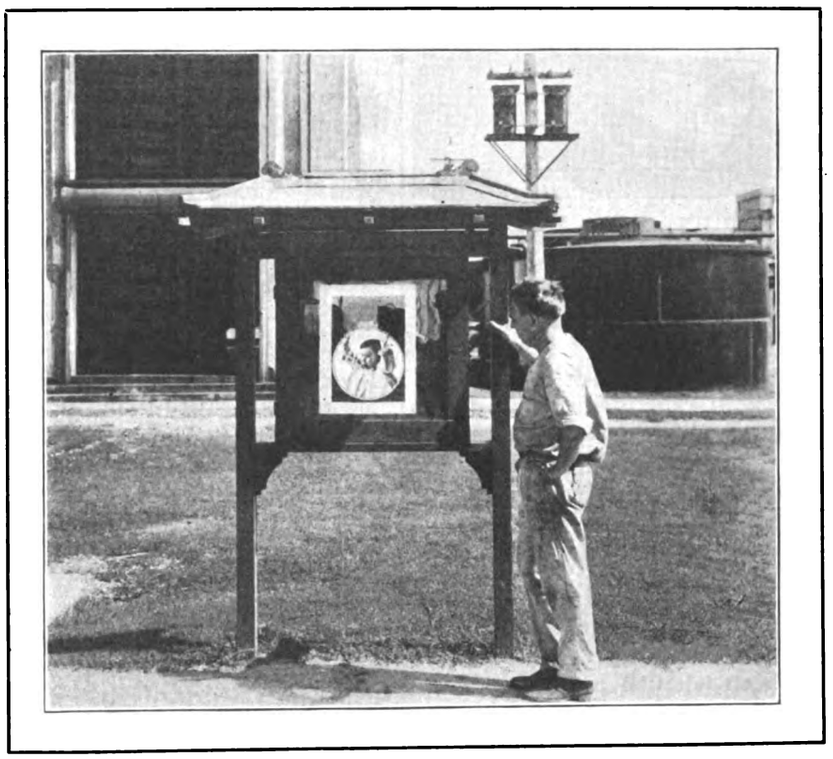


Fig. 1. Love of family affords a strong basis of appeal for carefulness.

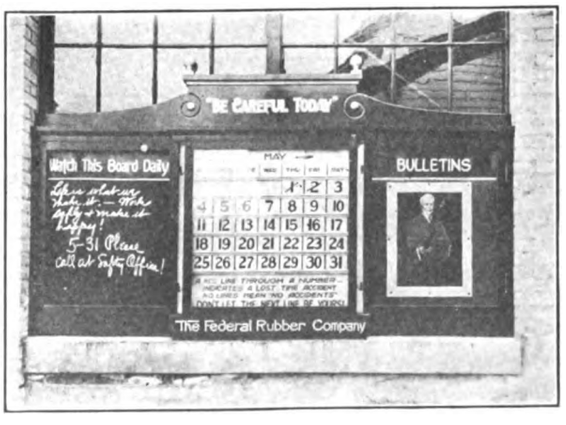


Fig. 2. The reading of bulletins is a voluntary act. Therefore, the bulletin board display must have the power to attract attention and hold interest, in order to "sell" its message.

Infections resulting from scratches, cuts and other small wounds caused a large amount of lost time in a large Eastern factory. A specific case was photographed to show the evil results of infection caused by carelessness on the part of the workman in not going to the first aid room. The picture was made more forceful with a brief inscription surrounding it, admonishing the workmen to consult the plant dispensary immediately after suffering a wound of any nature. In the month that followed the posting of this bulletin in the plant, there were fewer cases of infection than in any one week in the year previous.

Another company experienced a large number of eye injuries due to the refusal of employees to wear goggles. A bulletin was prepared with one purpose in mind: to demonstrate beyond the shadow of a doubt that the goggle was a good piece of equipment. One hundred pairs of goggles, their crystals cracked—but not shattered—in saving the eyes of as many workmen, were photographed in a group and below this picture were printed the words "One Hundred Reasons Why Goggles Should Be Worn."

The men in that plant wore goggles after that and there were few eye injuries.

There are approximately 8,000 industrial plants in this country now teaching their workmen safe habits, through the medium of the bulletin. The Eastman Kodak Company uses one bulletin board for every hundred employees. Some companies use as many as one to every 60 employees.

A considerable degree of success is reported by the

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A testimonial of the successful service of this type of pressed steel construction (embodied in both the pulley and the hanger) is found in the six million American Pulleys in use in the United States and foreign countries.

Worthy Companions

THE American Pressed Steel Shaft Hanger now "teams up" with the American Steel Pulley to develop maximum efficiency in power transmission.

The combination of these two "American" units is the result of 25 years' experience in power transmission problems.

The "American" Hanger is made entirely of steel, of unusual strength, and designed to provide a rigidity which will eliminate vibration. Its easy, smooth and graceful lines make it a pleasure to see, and in use it is an addition to the good appearance of any shop.

The American Pulley Company's guarantee stands back of both hangers and pulleys.

If you are interested in greater and more efficient power transmission, you will want the special folder that describes in detail the new American Pressed Steel Shaft Hanger. Write for it today.

Every "American" dealer's name, address and telephone number are listed in MacRae's Blue Book to help bring in orders.

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Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shapes, and Pressed Steel Shaft Hangers

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PRESSED STEEL HANGERS | **STEEL SPLIT PULLEYS**

PATENTED PATENTED

American Radiator Company with a bulletin service in which the camera plays an important part. Photographs are taken showing the cause and result of an accident. These are mounted on heavy cardboard and the inscription is made by a sign painter. These bulletins tell the complete story of an accident pictorially.

Only such instruction regarding safe methods as can be presented pictorially with brief, explanatory text should, as a rule, be given in the form of a safety bulletin. These bulletins must be brief. All that should be expected of them is to put over one idea, fix one impression in the reader's mind and do that in a glance.



Fig. 3. This poster has had a marked effect in promoting the idea that it is worth while to be careful.

To have merit, a safety bulletin must have high attention value. The reading of bulletins is a voluntary act on the part of the employee. Therefore, the bulletin and, in fact, the entire bulletin board display, must have the power to attract his attention and hold his interest long enough to put over the message. The elements that make for attractive display in a bulletin are color, illustration, decoration, typography and layout.

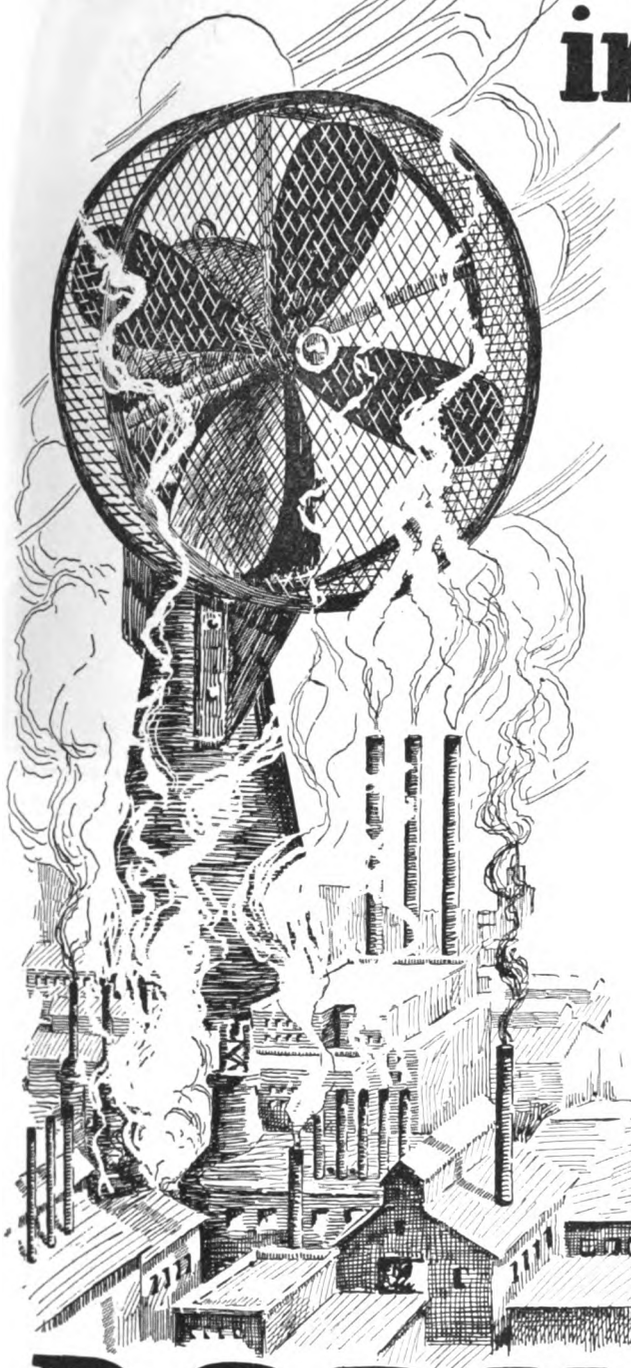
Safety bulletins should be pleasingly striking, not shockingly repulsive. They should not be preachy nor should they "bawl out" the workman. Copy should not shoot over the heads of the readers. If the bulletin cannot be understood, by a fourteen year old boy, its value is doubtful. Safety bulletins in general should be of a positive rather than negative character.

The effort should be to direct the worker's mind toward the safe way of doing things, rather than to remind him constantly of the ghastly results of accidents. As a general rule, a man cannot be scared into becoming a careful worker.

There should be a variety in the appeal of the bulletin board publicity. Safety bulletins are of different kinds: Those with an emotional appeal, the purely instructive bulletin and the slogan. The nature of the appeal should be varied as often as possible when the posting of the bulletins takes place. An emotional appeal always makes the deepest and most permanent impression because the average person's acts are controlled by his emotions rather than his reason. The emotional appeal is the quickest way to stimulate action. The following instincts may be appealed to in safety bulletins: self preservation, devotion to family, economy and saving—the pocketbook appeal—sympathy, competition, imitation, reputation, constructiveness, curiosity, loyalty, pride, and appreciation of the comic.

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Wherever heat is used in Industry



THERE is a Robinson Fan for every cooling purpose. Wherever heat is employed and workers are subjected to abnormally hot temperatures, the Robinson Kooling Fan will increase production and decrease labor costs. It is common sense logic to presume that labor can produce more work in any given time if working conditions are more favorable. Not only that but men will not work where they are subjected to intense heat. Robinson Kooling Fans keep men on the job; increase their capability for work and are generally a decided factor for speeding up production.

These facts have been proven to numberless large users of Robinson Kooling Fans all over the country. We know that you will appreciate its efficiency. As a demonstration of this confidence we will be glad to ship these fans on approval. If they substantiate our claims, you will join the ever-increasing number of Robinson Fan users. Submit your cooling problems to our Engineering Department.

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Write TODAY for Our Booklet, "Cutting Production Costs"

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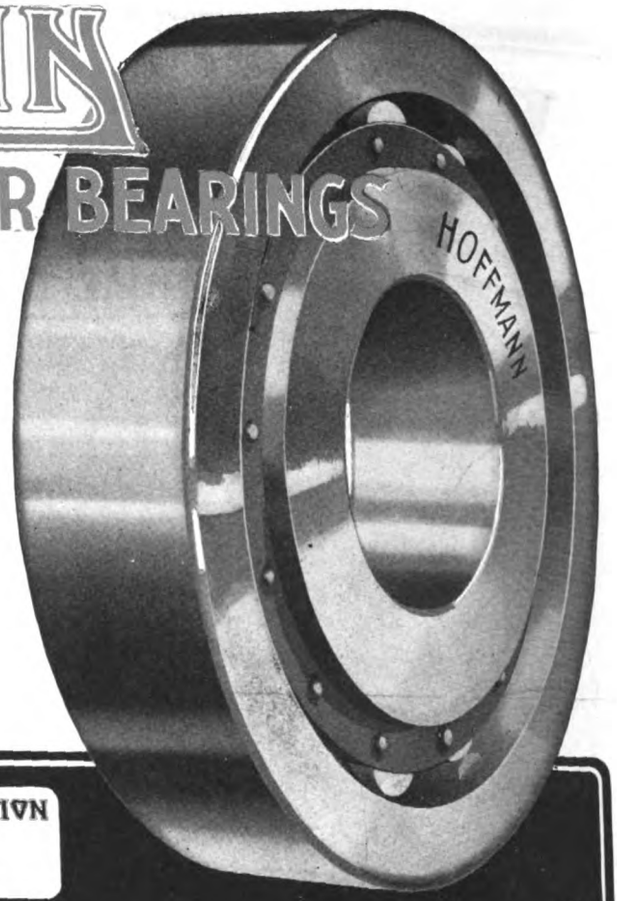
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Make Good Machines Better

With all the speed qualities of the best ball bearings—with a steady load capicity far greater than that of any ball bearing—with a large temporary overload capacity—with ability to meet shock, jar and vibration—with magazine lubrication to protect them against careless or neglected oiling—**"Hoffmanns"** are supremely the bearings for heavy-duty machinery.

Our engineers will be glad to work with you, in applying these high-precision heavy-duty bearings to your machines—to reduce maintainance, improve performance, increase output.



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Stamford - Connecticut
PRECISION BALL, ROLLER AND THRUST BEARINGS

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ANNOUNCES



THE Easton Car and Construction announces the establishing of a general office and works at Kansas City, Mo.

This new plant will serve the Mid-West and Western part of the United States with typical Easton speed and co-operation.

The same Easton designs, plans and blue-prints,—the same Easton quality of workmanship,—the same Easton sales policies will be followed at the Kansas City Works.

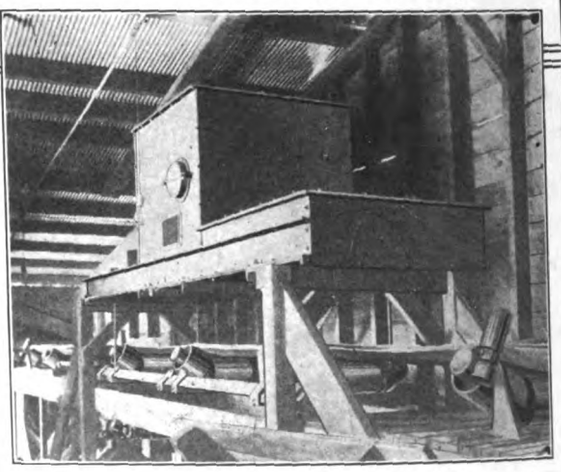
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A Merrick Conveyor Weightometer Prevents Weight Losses—and Saves Time—Labor and Money



Carelessness and guess work is eliminated and losses prevented because the Conveyor Weightometer accurately records the correct weight.

There is no loss of time—no extra labor—no additional expense—the Weightometer is simply attached to your conveyor and as the material is being conveyed—whether entering or leaving the plant—it is automatically and correctly weighed. You have a clear and irrefutable record of the exact weight, that is an absolute check on your bills of lading.

Can you realize your annual savings from carelessness and incorrect weighing problem to an absolute certainty. Write for special catalog.

MERRICK SCALE MFG. CO.
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Do You Get the Light You Pay For?

What Lighting Maintenance Really Means

By J. J. McLaughlin

Illumination Bureau, Westinghouse Lamp Company

THE same principles which apply to the upkeep of tools and machinery apply equally to the maintenance of a lighting system. In reality the lighting system of a shop may be considered one of the most important tools used there. Poor light hampers a workman and causes as much trouble and delay as the use of dull tools would. Just as it is cheaper to sharpen a tool than to employ a dull one, so it is equally true that washing is cheaper than watts.

To see just what occurs in a neglected lighting system, let us analyze Fig. 2, which shows the results of a test made during twenty-eight days after the system was installed. The initial intensity was 13.4 foot candles on the working plane, but after twenty-eight days of service, the intensity was only 11.1, a reduction of 17.2 per cent. You can readily see what the result would be if cleaning were postponed much longer.

Contrasted with this is the situation shown in Fig. 3. The first example given here is that of a lighting system which was providing an illumination of only 2.75 foot candles. Through proper attention this was increased to 7 foot candles. In the second example, the illumination was increased approximately 3 foot candles, and in the third example the increase was about 2.5 foot candles.

In addition to the care of the lighting units themselves, two other factors must be considered in the proper maintenance of a lighting system. First, walls and ceilings should be kept clean and should be refinished as conditions demand. These serve as reflectors for a goodly portion of the light and if they absorb too much of it, the working planes will not receive their share. Frequent washing pays well.

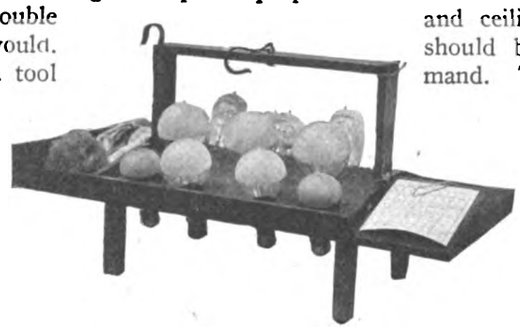


Fig. 1. An easily made lamp and tool carrying rack which saves time and labor. See also Fig. 6.

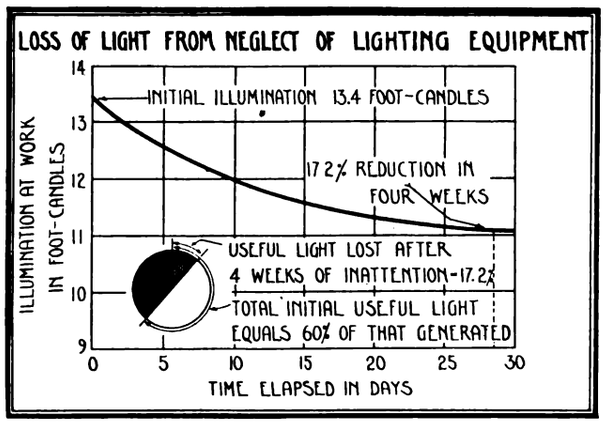


Fig. 2. The results of a test of a newly installed lighting system, left uncleaned.

In finishing the walls, it is well to bear in mind the effect different colors have on the light. Dark colors absorb and light colors reflect, as shown in Fig. 4. All lighting systems will be more effective if the upper walls and ceilings are of a light color, while the use of these reflecting shades is an absolute necessity where semi-indirect and totally indirect systems are used.

The second factor to be observed is the relation of the lamp voltage to the circuit voltage. Fig. 5 shows the loss in candle power when the voltage of lamp and circuit vary. For instance, if a 110 volt lamp is used on a 100 volt circuit,

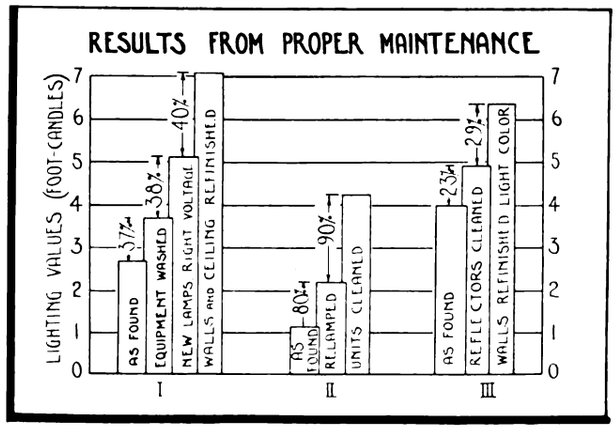


Fig. 3. This presentation of three typical cases tells its own story of what lighting maintenance does.

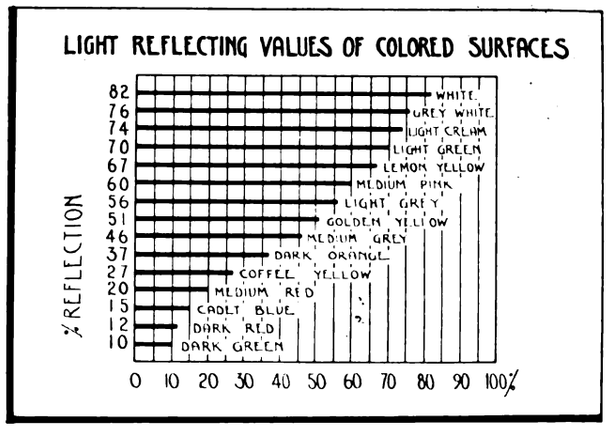
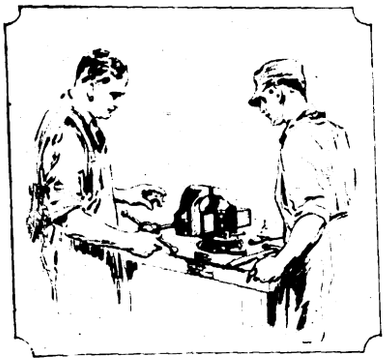


Fig. 4. It is good economy to plan the color scheme of wall and ceilings for best lighting efficiency.

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6 Points of Extra Value At No Extra Cost

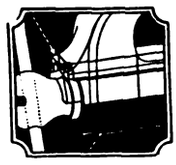


Here Are Two More

Last month's advertisement explained the superior construction of Parker Renewable Steel Jaws and the Parker Swivel Base. Here are two more Parker Features that give greater vise value at no additional cost.

Main Screw Easily Removed For Lubrication

A vise, like any machine, works better and lasts longer if it is properly lubricated. Lubricating the main screw on ordinary vises is a messy and unhandy job, and naturally it is often neglected. In Parker Vises proper lubrication of the screw is made easy. The saddle is on the *outside*. (See the accompanying drawing). It is but a few minutes work to take out the screw holding the collar, remove the main screw, as the man in the illustration is doing, lubricate it and replace it.



Solid Underportion

Putting the saddle on the outside, permits the underportion of Parker Vises to be cast solid, instead of hollow as in ordinary vises. This greatly strengthens the slide and the whole vise.

Parker Vises cost no more than ordinary vises. Let us send you our New Catalog No. 57B, showing all the Parker Features and the complete Parker line. Address, (Attention of W. R. B.)

The Charles Parker Company

Master Vise Makers

MERIDEN, CONN. U. S. A.

PARKER VISES

GRIP LIKE A GRIZZLY

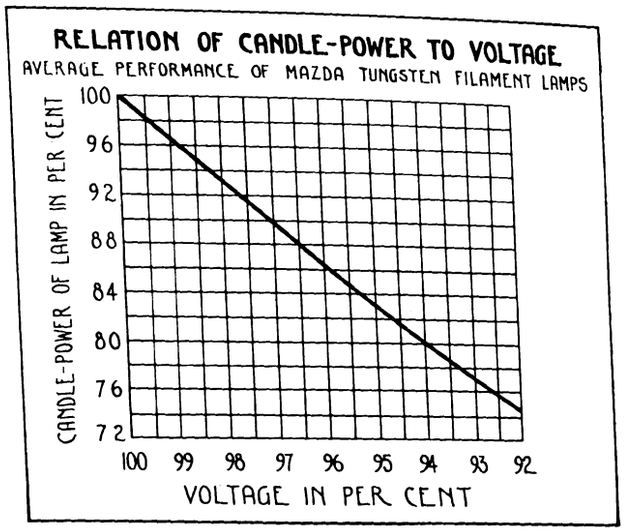


Fig. 5. Note that only a three per cent. drop in voltage produces a ten per cent. drop in candle power.

it would give only 74 per cent. of its candle power. With only a 3 per cent. difference between the voltage of the supply and the rated voltage of the lamps, there is a difference of 10 per cent. in candle power.

When the lighting system is of large proportions, the maintenance man or crew should have facilities for cleaning the lamps easily and quickly. The lamp and tool carrying rack shown in Figs. 1 and 6 will save a great deal of time and labor. It is a simple rack of wood with cutout holes to carry a number of lamps, and sections for cleaning rags, tools, and a record card for lamp renewal data. Use of this rack protects lamps from breakage, and its light weight enables the man to carry it up a ladder and hang it there with all his paraphernalia in easy reach.

In a careful analysis of good lighting, it has been found that the expense of such lighting compared to the results is a very small part of the operating cost. However, if it is neglected for some time the same results can only be obtained at an increased cost, as production and quality are lowered by the lowered efficiency of the light.

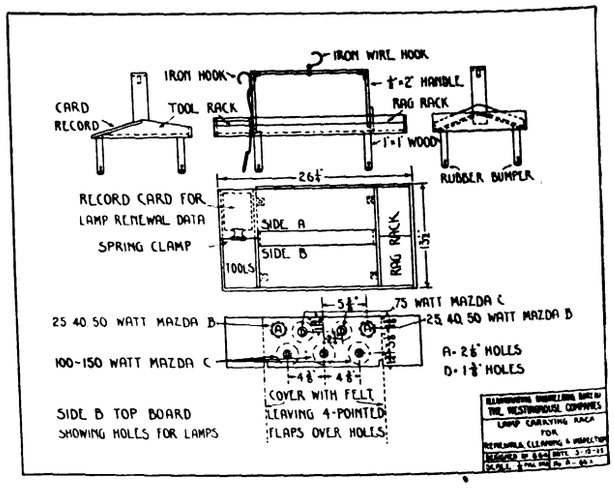


Fig. 6. Working drawing of the carrying rack which is shown in Fig. 1.

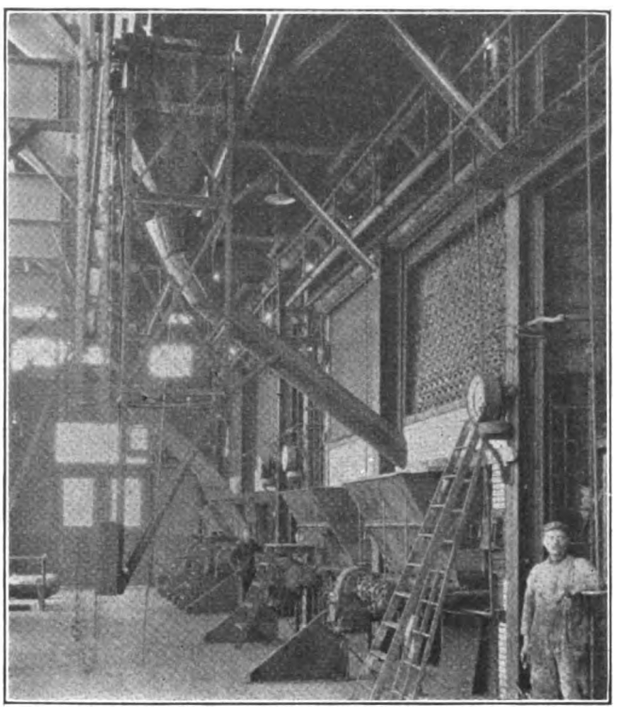
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Making Boiler Tubes Accessible

IN this mechanical age everything is being done to reduce costs and to eliminate hard manual labor.

Formerly a boiler room was a place of drudgery and was often neglected because of the hard work involved in maintaining the equipment as well as stoking the fires.

Today, mechanical equipment stokes the fires and the fireman is a skilled mechanic, but it is still necessary to clean out tubes and make repairs. Many boilers are



Steel rolling shutter used as a front boiler plate.

still equipped with cast iron front plates which have to be removed in order to get at the boiler tubes, and this work is generally slow and difficult.

In the accompanying illustration, the front boiler plate is replaced by a steel roller door which is easily run up by hand when it is desired to make the tubes accessible. This is only a small feature, but in the lifetime of the boilers it saves many hundreds of dollars, the actual saving depending upon the condition of the feed water being used. This is not a new idea, but it is one that is frequently being overlooked in the construction of new boiler houses.

APRIL volume of building contracts amounted to $546,970,700 for 36 eastern states of the United States, which is the largest monthly total on record, according to F. W. Dodge Corporation. This was an increase of 14% over March, 1925, and 13% increase over April, 1924. Total construction begun during the first four months of 1925 is 7% greater than for the first four months of 1924.

"THEY KEEP A-RUNNING"



7½ H. P. Century Repulsion-Start Induction Single Phase Motor

They Develop Heavy Starting Torque

The heavy starting torque developed by Century Repulsion-Start Induction Single Phase Motors renders them especially desirable for the operation of refrigerating machines, crushers, mixers, pumps, heat regulators, sewerage disposal equipment, garage air compressors and also other similar apparatus usually employing automatic or remote control.

The low starting current requirements of this motor—not in excess of 245% of full load current—permits the use of any standard single throw switch for starting. A fuse which will protect the motor while running and carrying its load, is usually of ample capacity for starting due to the low starting current and quick acceleration.

The new Century Wool-Yarn System of Lubrication can now be furnished in all Century RS Motors of fractional horse power sizes.

Built in all standard sizes from 1/8 to 40 horse power—temperature rise not more than 40 deg. Centigrade.

Send for Bulletin No. 29

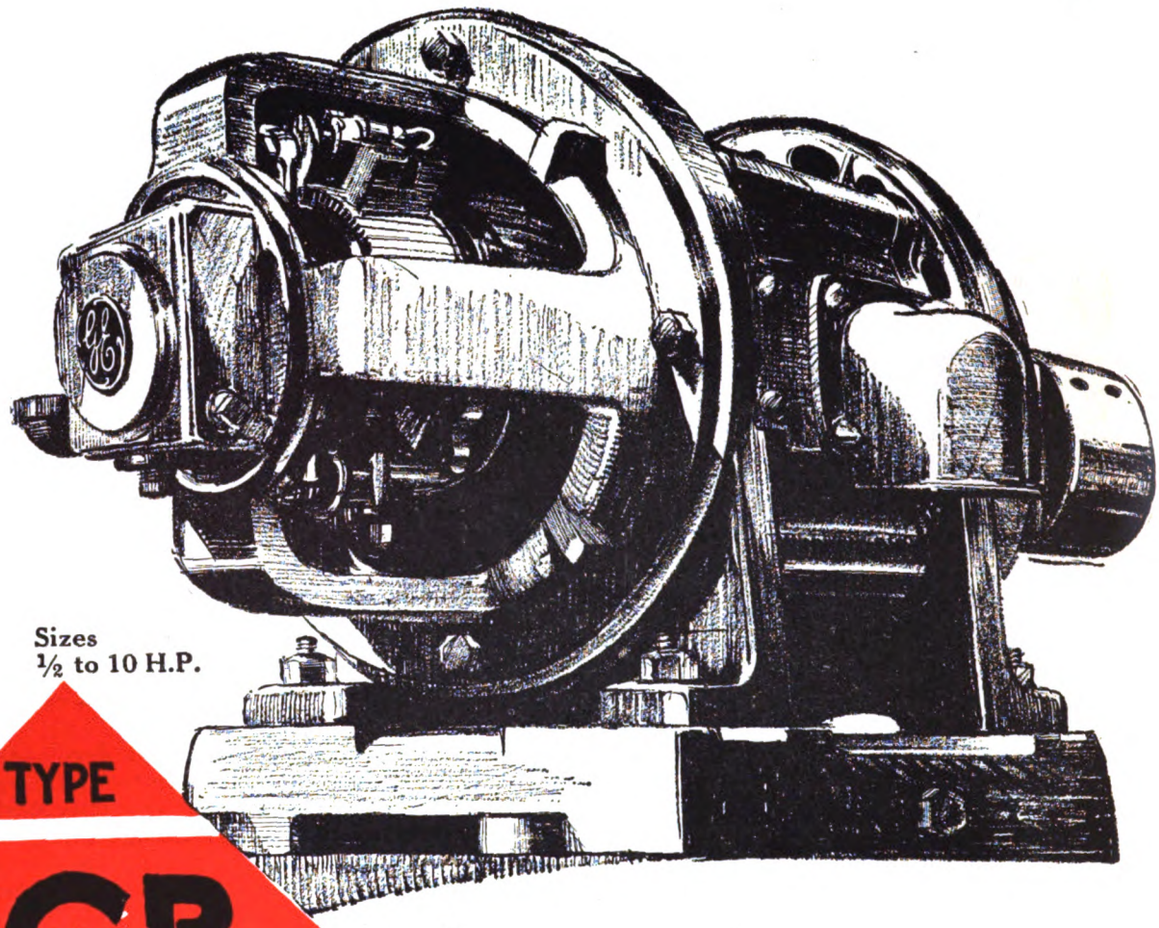
Bulletin No. 29 describes all superior features of Century Repulsion-Start Induction Single Phase Motors—a copy will be mailed to you on request.

Century Electric Co.

More than 23 years at St. Louis, Mo., U. S. A.

1/8 to 40 H.P. Century MOTORS **1/8 to 40 H.P.**

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Sizes
½ to 10 H.P.

TYPE
SCR
MOTOR

Characteristics:

High Torque
—Start
—Acceleration
—"Pull Out."
High Efficiency
High Power Factor
Low Starting Current
Low Heating
Excellent Commutation
—Overload Capacity;
—Speed Regulation.
Quiet
—Starting
—Running
Positive operation
on low voltage

Just what it looks to be

The single phase moto

The type **SCR** single phase motor is

STURDY
CAPABLE
RELIABLE

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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What Users Say—

Nash Engineering Company
South Norwalk, Conn., U. S. A.

February 20, 1925.

General Electric Company,

West Lynn, Mass.

Gentlemen:

Attention of Mr. Fred M. Kimball,
Mgr. Small Motor Dept.

I wish to take this opportunity to compliment the men in your organization who developed and are building the SCR motor.

The simple and practical principle of operation of this motor appealed to the writer when it was first shown to him at Pittsfield when it was being developed. From the tests I saw at that time I was convinced that the motor was far ahead of anything that we had yet seen for single phase work, and we placed an order for 1300 motors, which I believe was the first large order the General Electric Company had for these motors.

We have now had an opportunity to check up the performance of SCR motors over a period of almost two years on the severest service where the motors are started frequently by automatic control in locations where they receive very little attention. These motors have proved in every way equal to our expectations.

We have had to take care of a good deal of trouble with other types of single phase motors prior to the development of the SCR, and it is a pleasure to put out our pumps with a single phase motor which gives practically no trouble at all.

—you can depend upon!

[illegible] COMPANY

President.

ICJ-wvl

EXCERPTS FROM OTHER LETTERS

"The pump that fills the new swimming pool of the Country Club is driven by an SCR Single Phase Motor and believe me when I say that this new type motor is a 'Cracker Jack.' The motor was selected too small for the job and is carrying 120% load without having a bit of trouble and with absolutely black commutation. This new motor is wonderful."

"We are using the SCR motor on our Campbell No. 1 Improved Floor Sanding Machine. We are pulling full load all the time, very often in rooms of high temperature, when the weak points in a motor very soon show up. We have been using these motors for nearly two years and have not found any weak points in them yet."

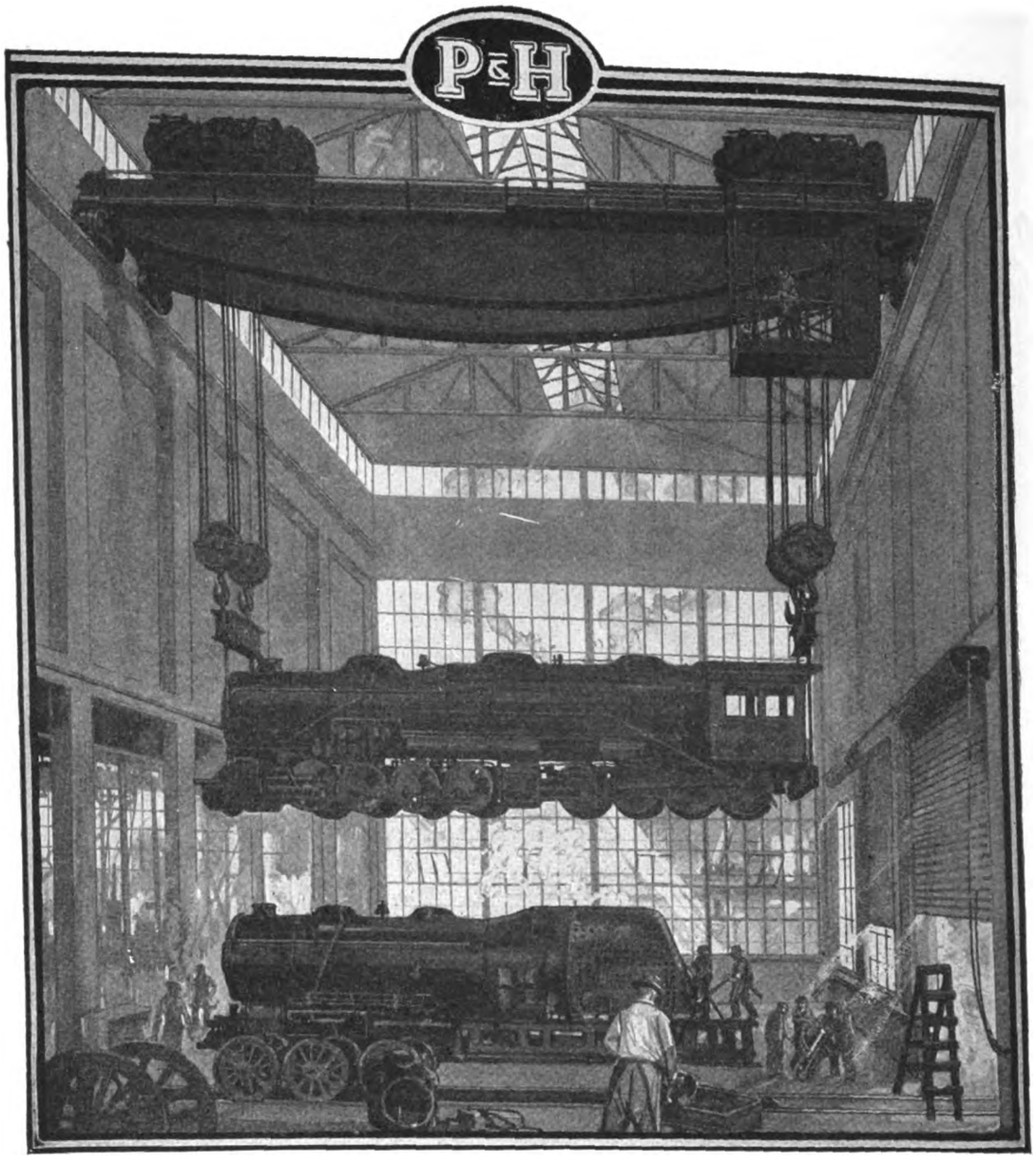
"The application to reciprocating automatic refrigerating machinery is as severe a duty as any motor can have. We have over 1,000 SCR motors of various sizes in service and have had no complaints. They start a very severe load with ease—run exceptionally cool—and are life savers of belts and the machinery in general. You have produced a motor second to none."

7D-4

ELECTRIC

SALES OFFICES IN ALL LARGE CITIES

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Look Ahead Ten Years in Buying Your Traveling Cranes

The crane service you have in mind now may be considerably changed in ten years.

Hundreds of P&H Cranes—because of their conservative ratings, generous design and thorough workmanship—have taken on extra work as their users' business expanded.

Here is where the plus value is made evident—where the difference in cranes shows up—the P&H takes on these extra duties—gives you immediate service to cope with expanded business. The extra precautions in designing and construction, the high-grade workmanship, the careful selection of materials—pay the buyer big dividends today—ten years from now and then some.

Look into the future when buying a Crane for the present.

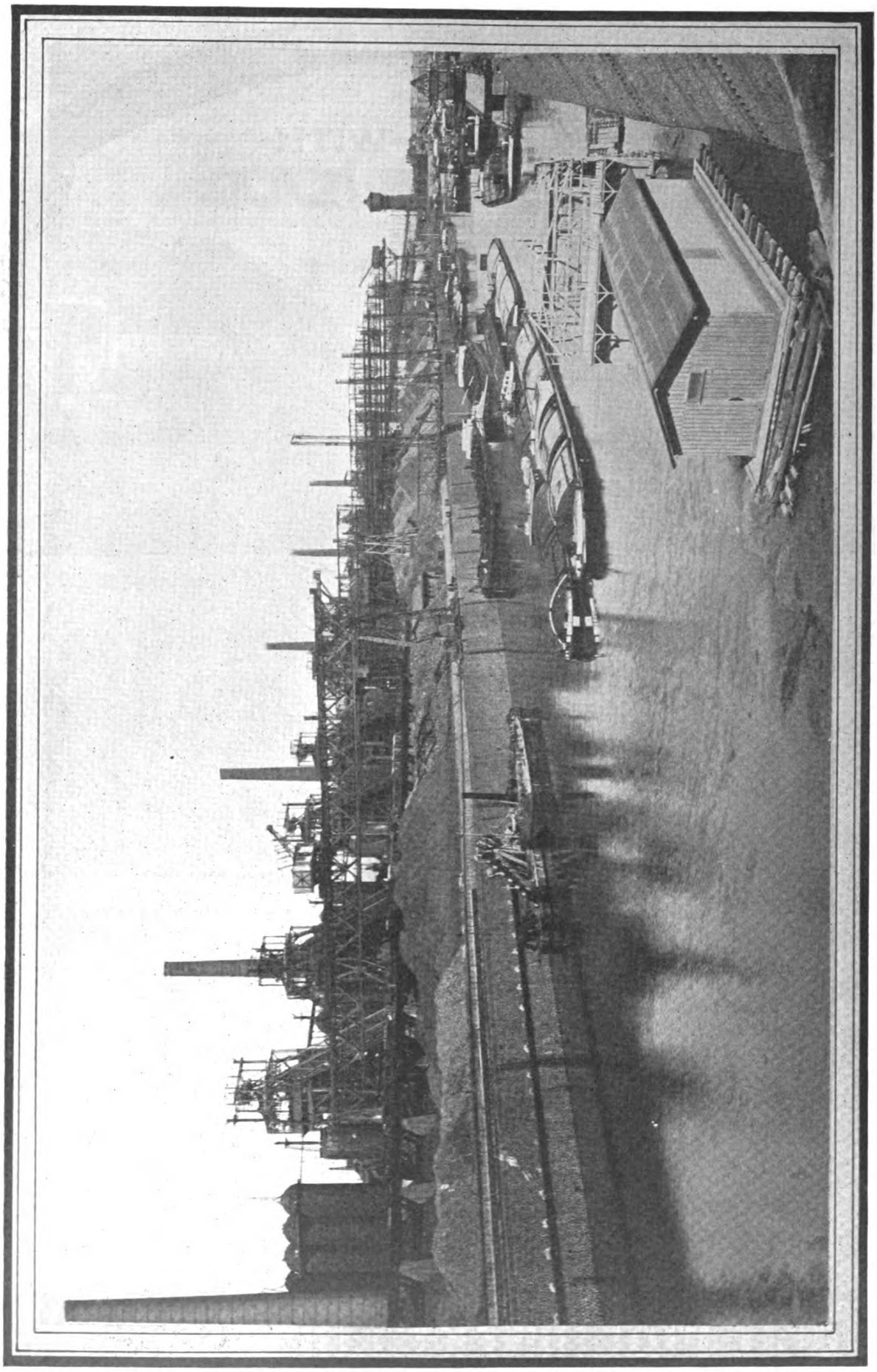
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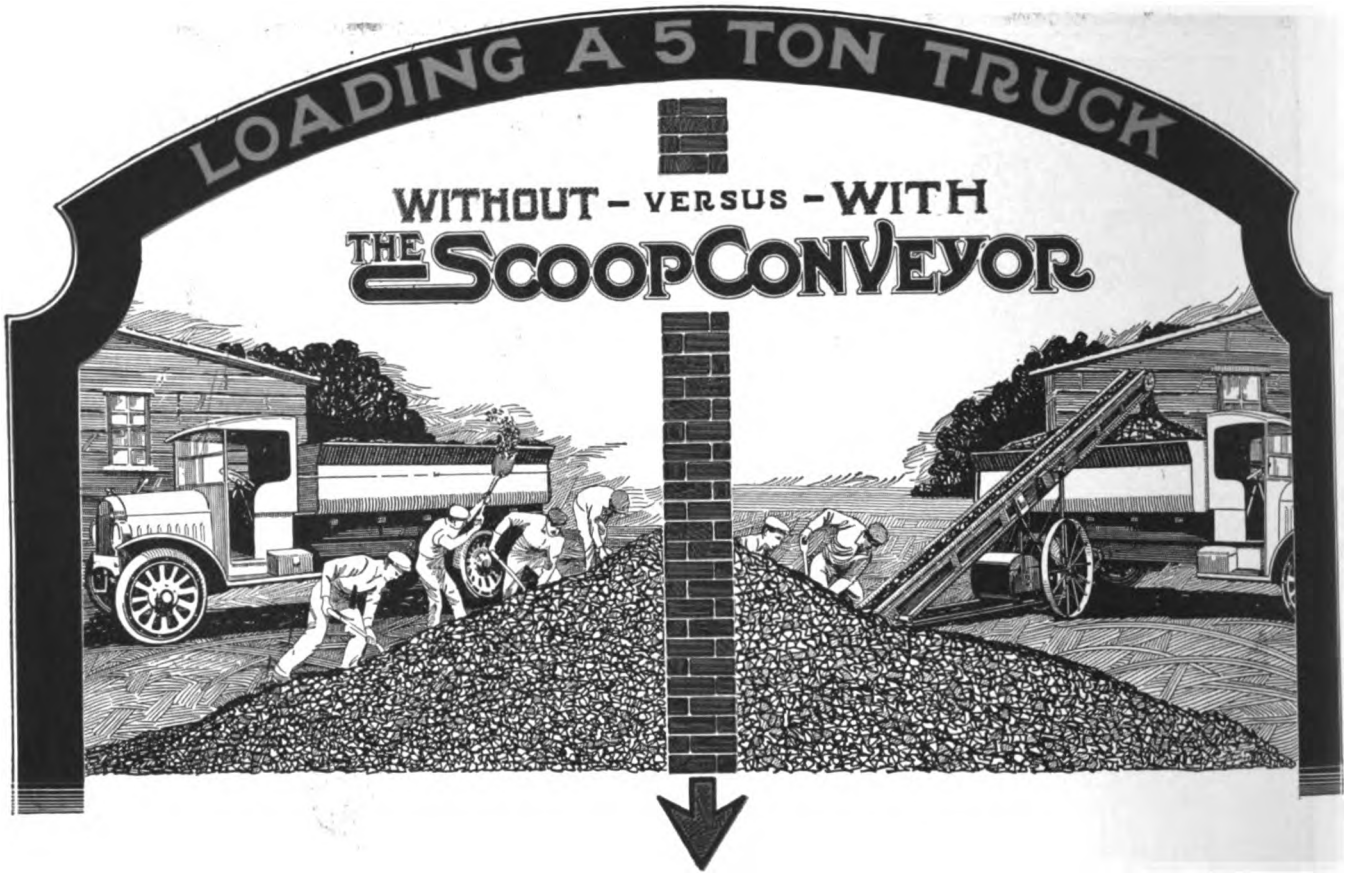
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SWORDS AND PLOWSHARES

A view of part of the great Krupp Works, at Essen, Germany. A decade ago probably the greatest producer of ordnance and armor in the world, this organization has converted its immense manufacturing facilities to peace time production. This particular view bears a striking resemblance to a section of the great River Rouge plant of the Ford Motor Company.

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25 Min. -	TIME TAKEN	- - 7 Min.
83c. - -	TOTAL COST	- - - 11c.
Tiresome - -	LABOR	- - - Easy
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CONVEYOR OPERATING AND UPKEEP COSTS GUARANTEED
LESS THAN 2c PER TON OF MATERIAL HANDLED.

NOTE—These Comparative costs are averages taken from reports received thru the courtesy of Thousands of Material Handlers who have used Scoop Conveyors for years.

REDUCTION of *idle truck time* by Speedy Loading is the source of greatest saving to the truck loader. *Two trucks* loaded by the Scoop Conveyor can transfer more material, over a 1 to 2-mile haul, than three hand loaded trucks. The elimination of *one truck* and *one truck driver* IMMEDIATELY *more than REPAYS* the cost of a Scoop Conveyor installation.

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Largest Circular Saw in the World

HENRY DISSTON & SONS, INC., of Philadelphia, recently completed for the Weyerhaeuser Timber Co., of Everett, Washington, what are undoubtedly the largest circular saws ever built.

These giant saws, one of which is shown in the accompanying illustration, are 110 inches in diameter, weigh each 675 pounds and contain 190 spiral inserted teeth.

In operation, these giants will cut through 48-inch Pacific Coast Hemlock at a rate of 900 cuts in an eight-hour shift. The rims of the saws will travel at a speed of almost two miles per minute. In cutting, the log is held rigid by dogging jaws and the saw is so suspended that it swings back and forth across the log.



There is no power plant in connection with the mill. The saws are to be driven electrically by a high voltage transmission line from another mill. For the first time in the lumbering industry an entire mill is to be operated by electricity—and without a power plant.

THERE were 76 strikes and controversies before the U. S. Department of Labor for settlement on May 9, 1925, of which 24 were new. This compares with 12 and 15 new cases for first and second weeks preceding. New cases involve building crafts, traction workers, photographers, cigar makers, textile workers, dredgemen, clothing workers, waiters, stove workers and elevator operators.



And That Difference Means Higher Standards of Accuracy and Durability

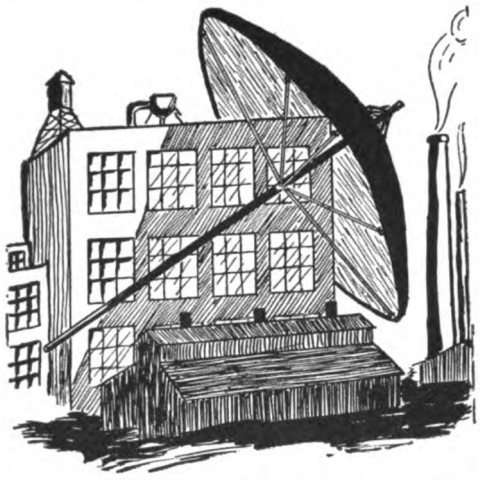
FOR production drilling The Jacobs Super Chuck will outwear any chuck ever made—and very slight pressure on the Key will hold the Drill with an unbreakable grip.

For tool room or ordinary drilling—or when used for holding work in the lathe—no Key is required.

Try just one and be convinced.

THE JACOBS MANUFACTURING CO.
HARTFORD, CONNECTICUT
The World's largest producers of "Drill Chucks."

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Like a Sunshade Over Your Plant

As manufacturers know, production increases tremendously on days when there is a haze in the atmosphere, lessening the intense glare of the sun.

BLU-EE, on the window glass, makes this condition constant, prevents eye-strain, allowing no glare, shadows, nor sweltering heat to penetrate into the factory. It acts as a huge sunshade over your plant.

No matter how dazzlingly the sun shines outside, BLU-EE filters out the blinding heat rays and allows only the light rays to enter.



It is more effective than awnings or shades and costs only a fraction as much. Will not rub off, but can be easily removed with warm water.

OUR OFFER

We will send you a box containing two packages of BLU-EE,—enough to cover 2,000 square feet. Use one of the packages as a trial. If you are not satisfied with the result, return the other at our expense and forget the matter. If it is satisfactory, mail us your check for $5.00 (Discounts for quantity orders). Fair enough, isn't it?

PARK CHEMICAL COMPANY
3820 Edwards Road
Cincinnati Ohio

Please send me 2 packages of Blu-EE, sufficient to cover 2,000 square feet of glass. It is understood that I am to use one of the packages as directed and will remit $5.00 for both if I am satisfied with Blu-EE, and if not entirely satisfied may return the other within thirty days and you will cancel this order.

Firm Name..... Position .....

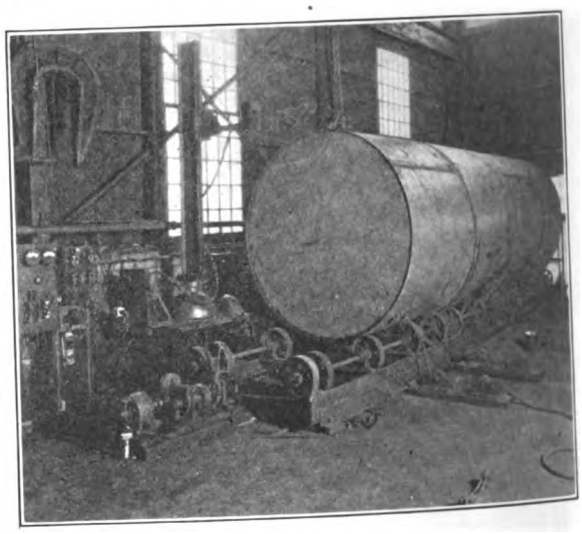
Your Name..... Address.....

A New Automatic Welder for Tanks

THE Lincoln Electric Company of Cleveland, Ohio, has perfected and just put on the market an automatic welder, for use in the manufacture of storage tanks.

The possible saving estimated through use of the new welder in the construction of storage tanks is said not to be based upon theoretical estimates, but the actual findings proven in the case of an installation of the equipment in a tank manufacturing plant.

With the new automatic equipment, it is stated that two hours and thirty-five minutes are saved on each 550-gallon tank built. The new Lincoln Automatic Tank



The new automatic electric tank welder

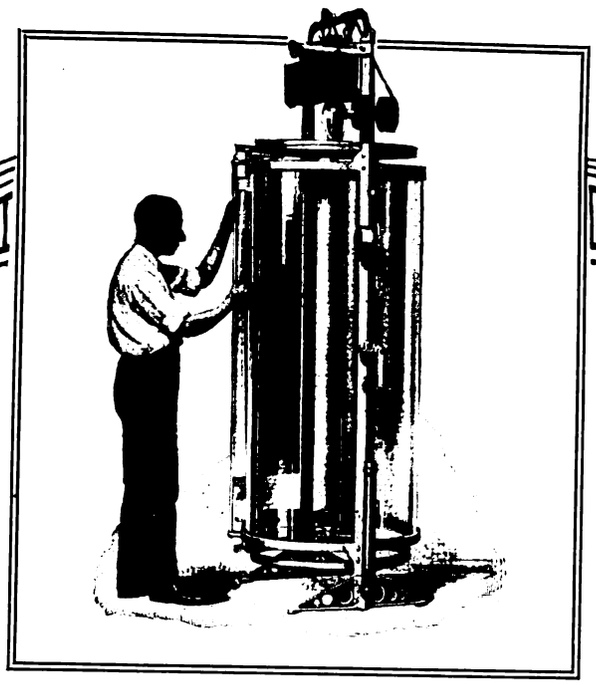
Welder, it is claimed, will completely weld a large tank in one hour and twenty-five minutes, against the old average of four hours per tank.

The illustration shows the installation of an automatic welder for seams and girths of an underground storage tank. The entire tank is assembled and tacked together. Longitudinal seam welds are made by an automatic moving head attached to a single copper guide.

After the seam welds are made, the tank is laid on wheels and revolved under an automatic carbon head, making the girth weld. With this equipment the average welding speed is between 50 and 60 feet per hour.

THE labor situation in the building trades industries was well stabilized in April, 1925, states S. W. Straus & Co. In several cities, long-term agreements were renewed at wage rates in force before the termination of existing contracts. Many of these agreements are not terminating until 1927 and 1928, which is expected to have a stabilizing effect on industry. There were only a few isolated cases of labor trouble.

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PEASE CHICAGO

PEASE CHICAGO

The Fastest Vertical Blue Printing Machine in Existence

Prints on Either Direct or Alternating Current

The Pease Vertical Blue Printing Machine will turn out a supply of perfect blue prints regardless of weather conditions at a faster rate of speed than can be turned out on any other equipment of the same type.

The Pease Vertical is equipped with the Pease U-V High Power Arc Lamp which is universal in that it may be used on 220 or 110 volts direct or alternating current, any cycle, with slight changes.

The Pease Vertical is so rigidly constructed that it can be shipped anywhere completely assembled without danger of breakage. It is rapid, noiseless in operation and foolproof.

The Pease Sheet Washer (not illustrated) is a worthy companion for the Pease Vertical. It takes up less room than a bath tray and washes the paper better. Prints are washed with running water, doing away entirely with open trays of water, dripping prints and wet floors.

Ask for Catalog M-28

The C. F. Pease Company

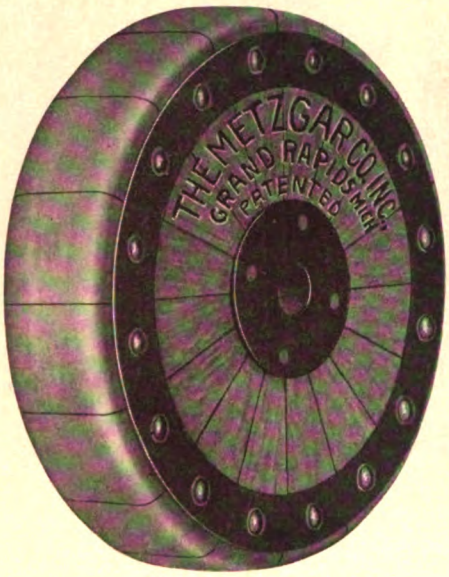
Blue Printing Machinery—Drafting Room Supplies

828 N. Franklin St. Chicago, Illinois

$100.00 IN GOLD

The C. F. Pease Co. offers $100.00 in gold to the person submitting the best slogan, accompanied by the best explanatory letter, of from one hundred to five hundred words, for promoting the use of blue prints. Any one may compete except company employees and their families. Five dollars each will be paid for non-winning ideas in either slogans or letters that we can use. Write for further information. Last call as contest closes June 15, 1925.

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METZGAR
END-GRAIN WOOD WHEELS

"Roll Out" a Big Saving on Any Type of Truck or Trailer.

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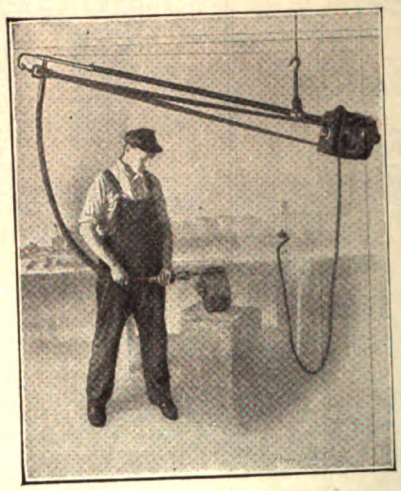
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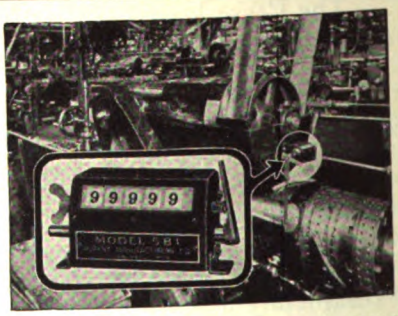
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The Passing of the "Gloomy" Factory

How Modern Construction Is Transforming Our Industrial Centers

By Harold K. Ferguson

President, The H. K. Ferguson Company



Fig. 1. A typical, thoroughly modern "daylight" building for manufacturing; a far cry from the factory of fifty years ago.

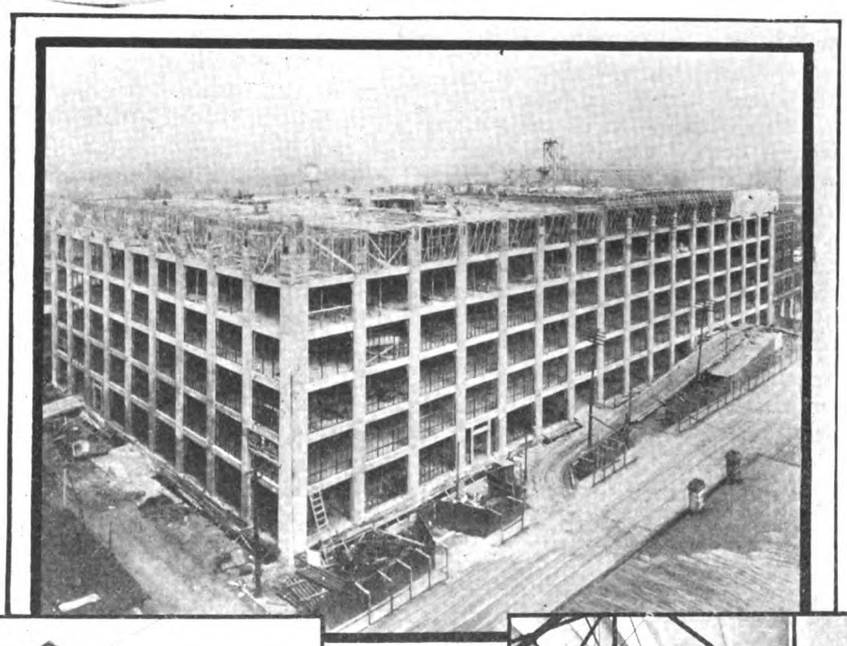


Fig. 2. The same structure as in Fig. 1, during construction.

NOT only has industry changed its conception of the types of buildings desirable to house a factory, but it is coming to be more critical of the individuals or organization responsible for the design and erection of its buildings.

The invention for knitting on a frame, the flying shuttle, Arkwright's spinning roller, and the application of the use of steam power along with other mechanical improvements had so centered interest in the possibilities of manufacturing, by 1801, that in that year the first real weaving mill was established in Glasgow.

Up until this time those who had entered industry had seen no special reason for buildings constructed to meet special requirements of factory conditions. Either a structure intended for other purposes or one built in the manner of a house served the purpose, because the producers had not yet conceived of weaving as much more than a family activity.

Even in the early years of the nineteenth century, history tells us that "rather than wait for new buildings to be constructed, weavers bought up old barns, outhouses, and cart sheds" and turned them into factories, so an-

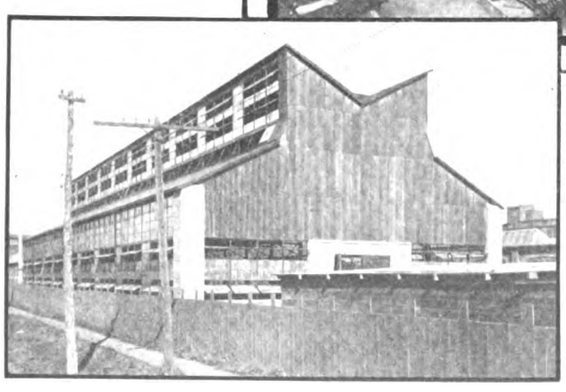


Fig. 3. Less attractive, but extremely efficient, is this modern mill type of building.

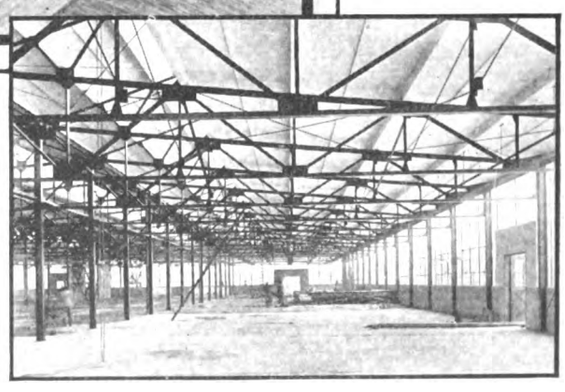
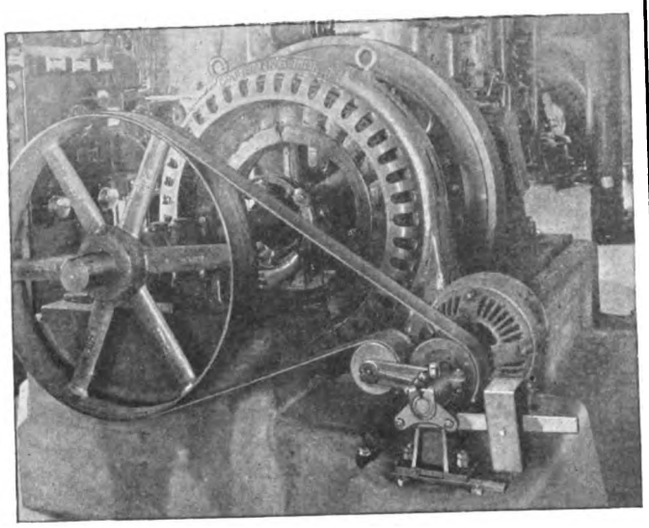


Fig. 4. Modern design permits of large, well-lighted areas of floor space unobstructed by posts.

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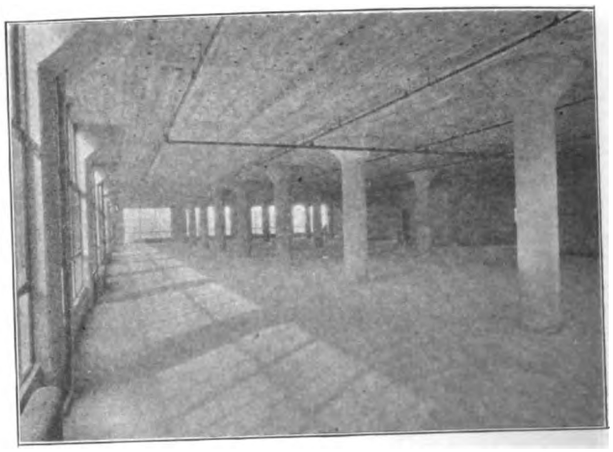


Fig. 5. Concrete, improved structural steel, steel sash, and a better understanding of factory design, all have contributed to eliminate the old-time dinginess associated with the manufacturing plant.

ious were they then to get into the manufacturing business.

After this early rush to enter manufacturing had somewhat subsided, we find the first serious thought being given to such matters as lighting, efficiency of floor space, safety of structure and special factory construction. In 1840 the first building erected especially for factory purposes appeared as a result of the recognition that manufacturing efficiency required a distinct type of structure.

In this country at about this period, where wood was plentiful, construction took one turn, while in England, where cast and wrought iron were being produced, it took another.

With the initial development of industrial life in America came an added stimulant to the evolution looking to the improvement of factory construction. Here the trend was toward the prevention of fire loss, through the substitution of thick solid timbers for those of the lighter sort used in England. An effort was made to eliminate concealed spaces, where fire could smolder. In place of the old type criss-cross floor structure, over which flooring of two layers of one inch planks was laid and on the bottom of which were nailed laths plastered to form the ceiling below, joist floors were substituted.

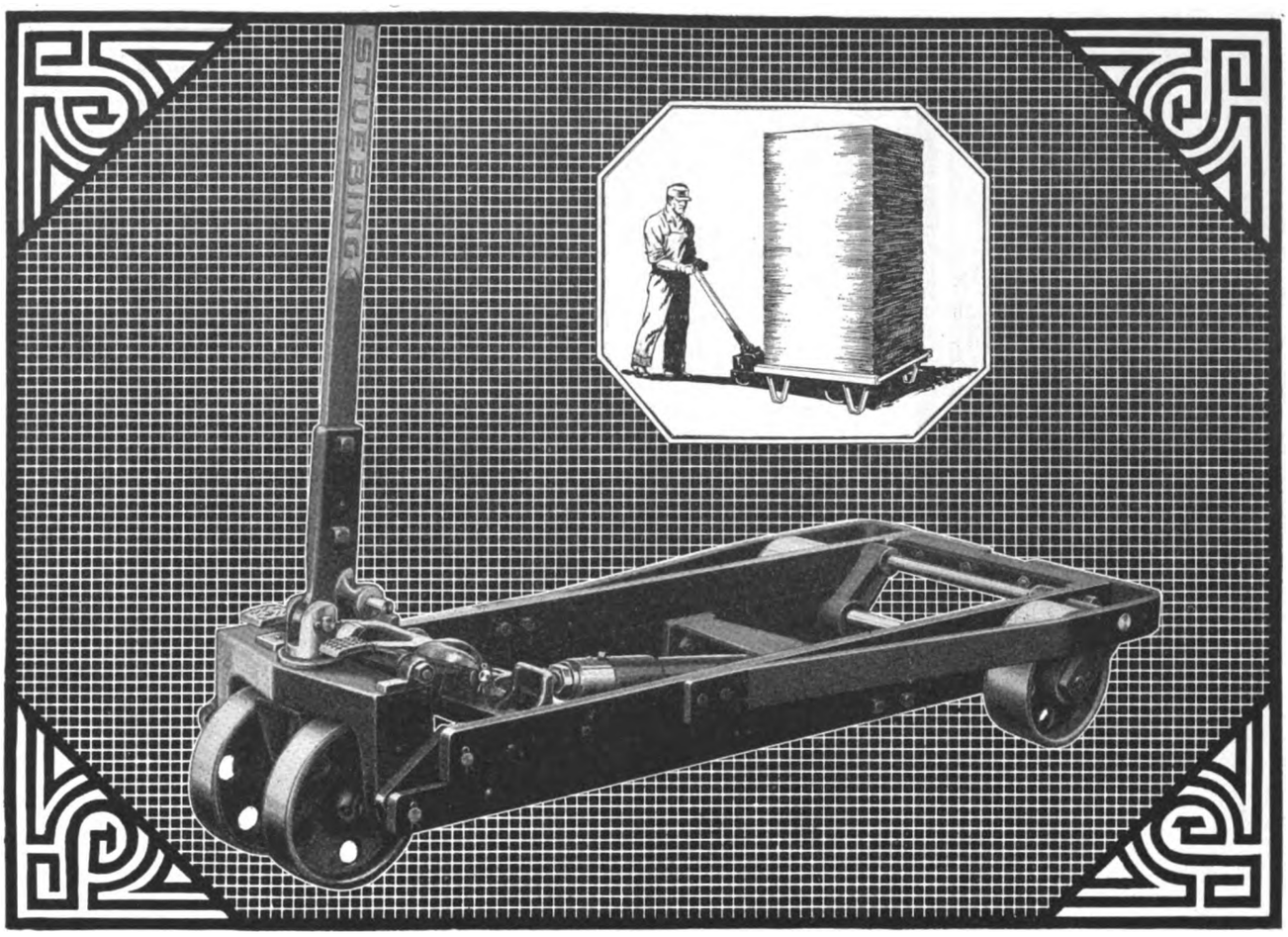
England clung to its old, original type of fire-trap and unsanitary building, long after Americans had started progressing to the modern buildings. When the more progressive owners there saw the relation of proper factory housing to efficient production and did turn their attention to improvements in that country, they swung to the erection of structures with brick walls of the pilaster and panel design, with cast iron inverted T shaped floor beams resting on iron pillars and supporting shallow arches of brick filled in on the top to form a level floor.

What was then known as "fireproof" construction did not find widespread favor in England until about 1865, because of the expense involved in the use of the necessary materials.

At about this same date, the evolution of factory construction made another forward step, in that the provision of better lighting became a consideration in design.

The introduction of new wall construction made up

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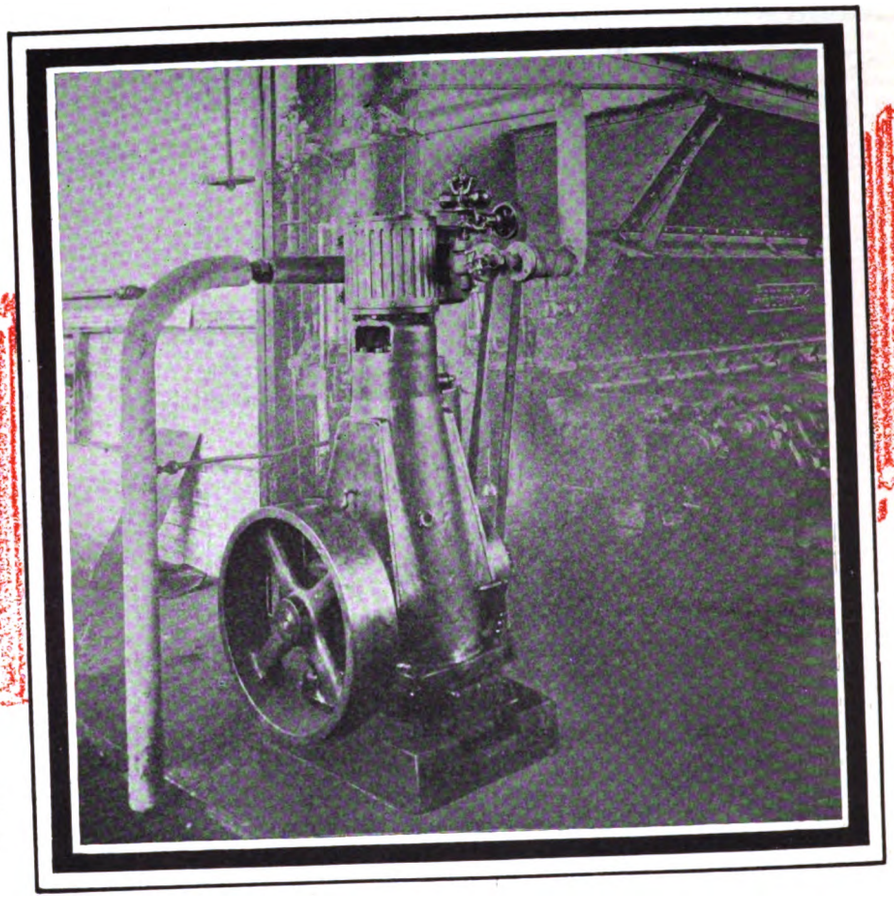
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of piers about three feet wide soon replaced the wide pilasters formerly used. Panel windows were still in vogue, but could be built slightly wider. This change provided better lighting, also permitted the successful use of wider buildings.

Later developments brought reinforcement of floor beams by cast iron arch ribs crossing the intervals between and sometimes further braced by wrought iron tie rods. The floors, however, remained brick covered with concrete and hard pine flooring, in the English factories through the industrial period of 1890.

And now we come to the start of the Twentieth Century which has already seen such rapid progress in the construction of industrial buildings and which is bound to experience even greater advancements during the coming few years. At the close of the Nineteenth Century, both the record of England and the United States indicated some betterments in construction, light, fire hazard elimination and the like and had to its credit, the creation of a live public interest which has demanded of recent years improved industrial construction such as we know today.

With the opening of the new century started the exodus of the old type brick and wood building, and the entrance of the concrete and structural steel and brick plants. In the mill type building, reinforced concrete handled under modern methods has found favor because of the savings made possible in its use. The use of concrete, reinforced with steel or iron has made possible the construction of a plant of any proportion laid out to fit the industry which it is to house. Another factor in its development has been its adaptability to modern standards for ample window space.

Not only has the use of concrete played a part in the forward march of industrial construction in recent years, but the improvement in such materials as structural steel, steel sash and the like, along with a better understanding of proper factory lay-out on the part of construction engineers, has aided materially in eliminating that dingy unattractive and inefficient picture which associated itself with factory buildings up to the twentieth century.

As industrial competition has become ever more keen, there has come a greater and greater recognition that the plant building must be made to serve the greatest possible productive efficiency, and it is in the construction companies of the United States that faith is placed.

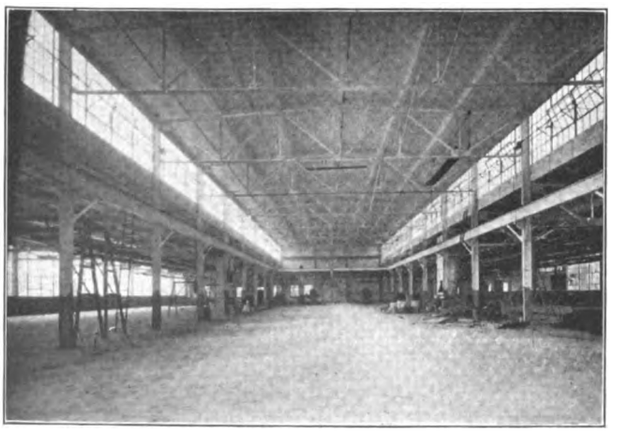


Fig. 6. Note how efficient lighting is provided for all parts of the working space in this newly completed factory building.



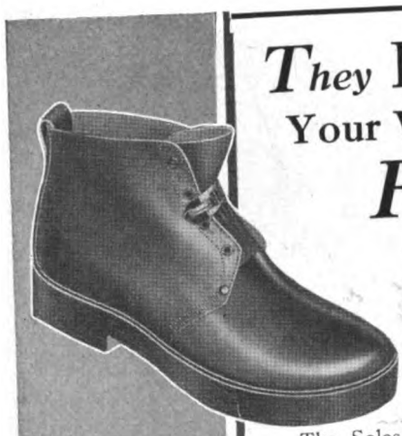
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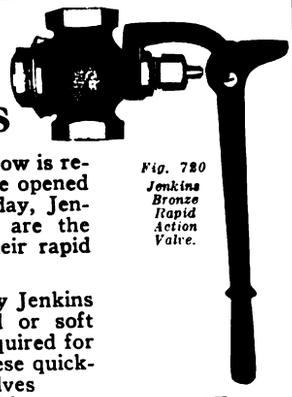


Fig. 780 Jenkins Bronze Rapid Action Valve.

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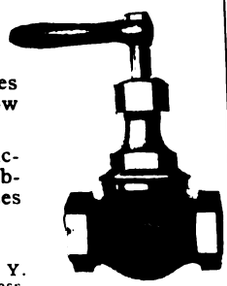


Fig. 241 Jenkins Bronze Quick Opening Valve.

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Descriptive literature on the subject of valves for all purposes is being issued by Jenkins Bros., 80 White St., New York. Another circular issued is on the Jenkins Air Gun.

Filters, Flow Meters, Hot Process Softeners and Deaerating Heaters

are described in several pieces of literature recently published by the Cochrane Corp., Philadelphia, Pa. The filter catalog, No. 1231, takes in the clarifying water for swimming pools, textile mills, power plants, etc. The flow meters described are of the indicating, recording and integrating type for steam or water in pipes.

"Big Door Hardware"

is the title of a new 24-page catalog which describes a method of handling big doors under various conditions. This is being issued by Richards-Wilcox Mfg. Co., Aurora, Ill.

Superior Drop-Forgings and Drop-Forged Tools

A catalog containing 192 pages of illustrations describes the product of J. H. Williams & Co., Buffalo, N. Y.

Gaskets and Flexible Metallic Packing

These subjects are described in literature which has been issued by Goetze Gasket & Packing Co., New Brunswick, N. J.

Machinery and Tools

General Catalog 138, containing 600 pages which list the line of machinery, tools, cutters, attachments, etc., manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I.

"Speed and Power"

This booklet describes speed reduction units as produced by Boston Gear Works, Norfolk Downs, Mass.

"Measuring CO_2 Electrically"

This is the title of a 16-page booklet issued by the Brown Instrument Co., Philadelphia, Pa. Descriptive literature also being issued is on the subjects of recording thermometers and pressure gages.

Forges, Fans and Iron Working Tools

These subjects are described in bulletins issued by the Buffalo Forge Co., Buffalo, N. Y.

Chucks

A condensed catalog describing the line of chucks brought out by the Jacobs Mfg. Co., Hartford, Conn.

Indicating Thermometer

The subject of thermometers for various uses is described in literature issued by the Moto Meter Co., Inc., manufacturers of the Boyce Moto Meter, at Long Island City, N. Y.

Steam and Radiator Traps

are described in two illustrated booklets recently issued by the Sarco Co., Inc., Woolworth Bldg., New York, N. Y.

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Taps, Dies, Screw Plates and Reamers

Catalog No. 19 contains descriptions of these tools, in addition to the ground thread, spiral pointed and spiral fluted taps and the straight and spiral fluted expansion reamers which have recently been a product of Butterfield & Co., Derby Line, Vt., a division of the Union Twist Drill Co.

Hose

for railroads, contractors, quarrymen, engineers, manufacturing plants, etc., is described in Catalog No. 80, issued by Mulconroy Co., Inc., Philadelphia, Pa.

Gas Boosters, Exhausters, Meters; Cycloidal Pumps, and Positive Pressure Blowers

are the products of the Connersville Blower Co., of Connersville, Ind., which are described in three bulletins issued by the company. The bulletins are Nos. 22, 20 and 21, respectively.

Industrial Ovens

Several pieces of descriptive literature on Freas and Thelco constant temperature apparatus have been issued by The Thermo Electric Instrument Co., 14 Johnson St., Newark, N. J.

Cost Cutting Tools

Catalog No. 9 contains 68 pages of descriptions of reamers, chucks, collets, face plates, etc., which are manufactured by the McCrosky Tool Corp., Meadville, Pa.

Cochrane-Bly Products

Consist of metal sawing machines, saw sharpeners, filing machines, vertical millers and vertical shapers, and these are described in a loose-leaf catalog which is being issued by Cochrane-Bly Co., Rochester, N. Y.

Stocks and Dies

Catalog No. 19 contains descriptions of stocks, dies, vises, taps, reamers, etc., which are manufactured by the Armstrong Mfg. Co., Bridgeport, Conn.

All Geared Drills and Tappers

are described in a catalog which is being issued by the Barnes Drill Co., 814-830 Chestnut St., Rockford, Ill.

Universal Drill

This half-inch electric drill is described in a bulletin which is being issued by the Hisey-Wolf Machine Co., of Cincinnati, Ohio.

Oval Dish Machine

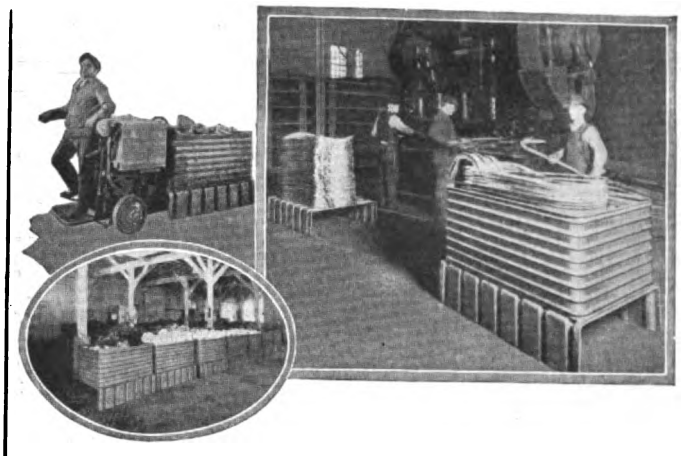
A descriptive bulletin on the new Knott-Barker Oval Dish Machine has been issued by the Ideal Foundry & Machinery Co., Beaver Falls, Pa.

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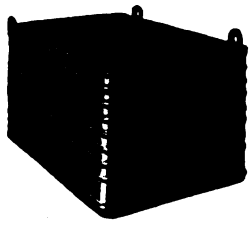
is described in Catalog No. 46, which is being issued by the Durant Mfg. Co., of Milwaukee, Wis.

Barco Products

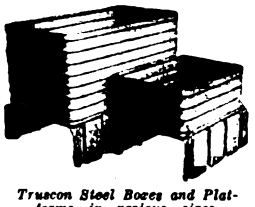
are described in several bulletins recently issued by the Barco Mfg. Co., of Chicago, Ill. These take in round house joints, flexible joints, power reverse gears, lubricated plug valves, etc.



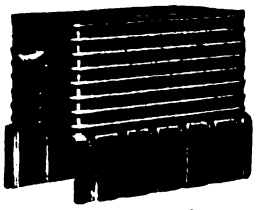
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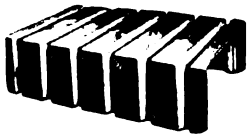
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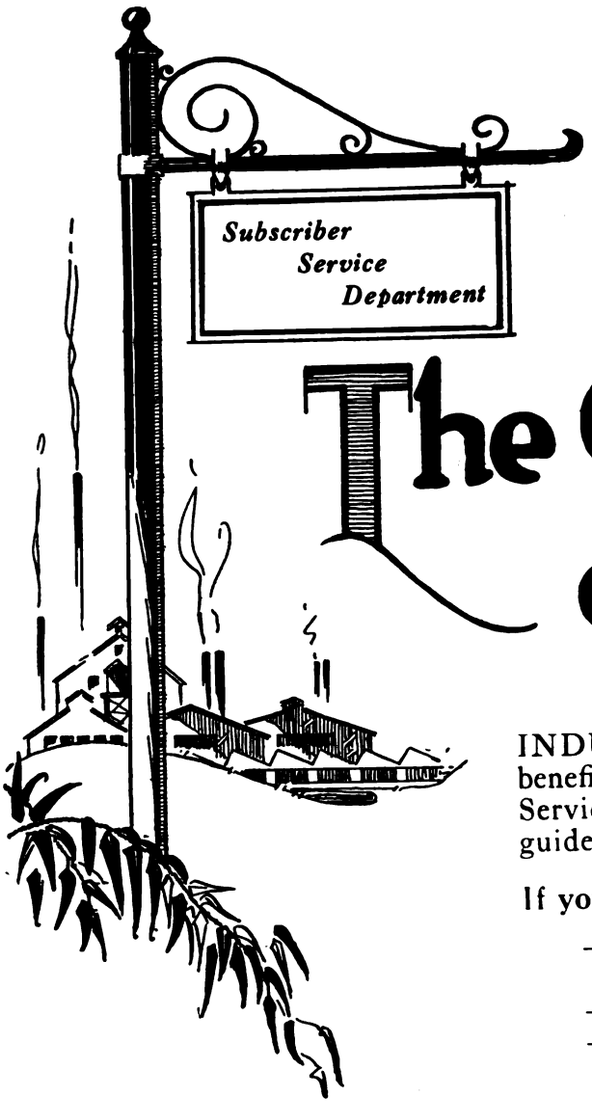
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Hard Facts About Hard Water

By Walter J. Hughes

Water Softening Expert, Wayne Tank and Pump Co., Fort Wayne, Ind.

WATER probably has been disregarded more than any other item which goes to make up the industrial structure of the nation. So far as the average industrial executive is concerned, water is just water. If the available supply happens to be rather well adapted to the needs of his plant, he considers himself very fortunate, and if the water is not suited to his needs he ordinarily proceeds to make the best of an undesirable condition.

There are a few exceptions to this general disregard for the quality of water. Factories using water for processing purposes must have a supply of water that is suited for that work, so they are careful to obtain a supply that is suitable. If such water is not available in its natural state, they resort to treatment of the water supply so that it will be well adapted to their needs. In other industries hygienic standards must be upheld, and it is necessary that the water supply be beyond possibility of contamination. Otherwise, largely, water is used "as is."

In some phases of silk processing, for instance, clean soft water is necessary to produce work of quality. In laundries, too, soft water is absolutely essential.

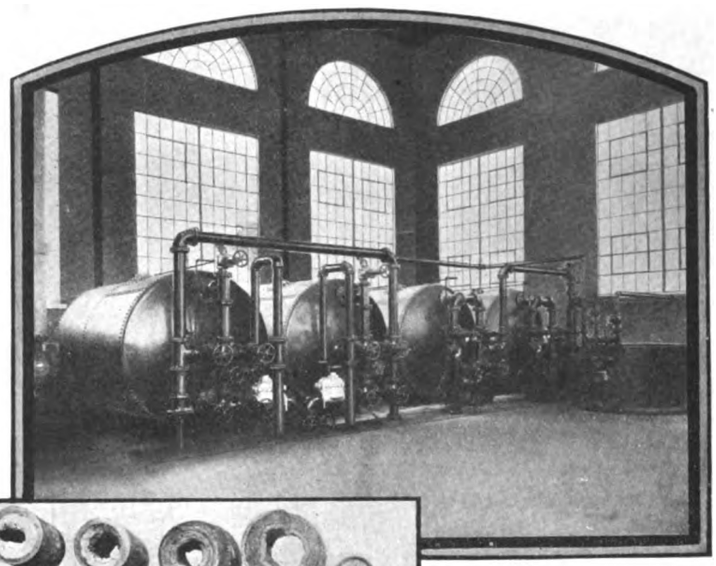


Fig. 1. The H. W. Johns-Manville Co., at Manville, N. J., find it sound economy to filter and soften the boiler feed water by the equipment shown above.

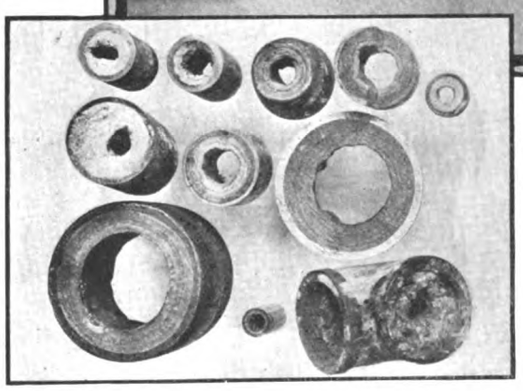


Fig. 2. These are typical—not exceptional—cross sections of boiler tubes and hot water pipes, showing how scale accumulates.

For boiler use, however, the quality of water and its fitness for boiler use generally has been neglected, although today this subject is receiving more attention than formerly.

If hard water is used, the boiler operates at zero efficiency insofar as the water is concerned. The elements that make water hard are the same elements that form scale. Although scale contains other substances, lime and magnesia are the causes of its formation. If hard water is used for feed, these substances are precipitated under boiler conditions, forming deposits of scale. Since scale is an effective insulation against heat, boiler efficiency necessarily lowers as heating surfaces become coated. The loss begins with very thin scale, the presence of which must not be excused because of its thinness.

To give some idea of scale losses in boilers, we may refer to the tests conducted at the engineering experiment station of the University of Illinois. The accompanying table indicates the losses found in transmitting heat through scale.

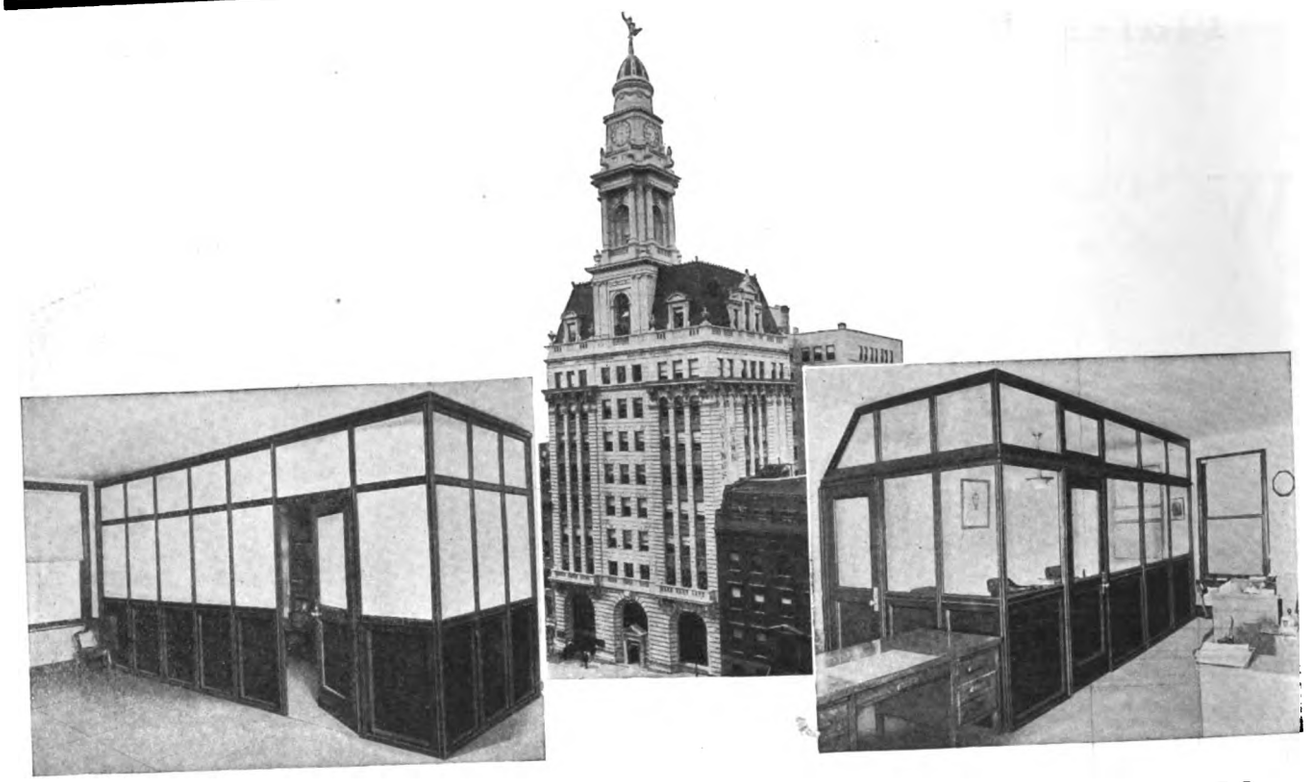


Fig. 3. The City of Milwaukee Sewerage Commission filters and softens all water for its boilers. (See Fig. 6).



Fig. 4. A collection of tubes from a water-tube boiler which, due to hard water, operated inefficiently and at high maintenance cost.

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Have Metal Partitions Made Good?

A RECENT example of Sanymetal Office Partitions is shown in these views taken in the City Savings Bank, Albany, N. Y. Here is an all-metal partition job that for appearance is fully the equal of wood, and for durability and sanitation far outclasses wood. Owners of high-grade office and plant office buildings are accepting the metal partition idea as never before, and the fine qualities of Sanymetal have played no small part in the change.

It will pay you to investigate Sanymetal. It's built by people who know how to build fine metal partitions and insist on building them *right*. Selected, heavy-gauge metal only is used. Trim and finish are scrupulously carried out to the last small detail, both inside and outside. Not a bolt or screw shows anywhere—all are concealed by moldings fastened by our special method. Glass is tightly set and stopped in with continuous drawn steel molds. Sanymetal is famous for extra rigid installation, shake-and-rattle-proof. And the surprising thing is that Sanymetal costs no more than "just ordinary" partitions. Take the measure of any similar partition made—get the figures—the chances are, point for point and dollar for dollar, you'll pick Sanymetal, hands down.

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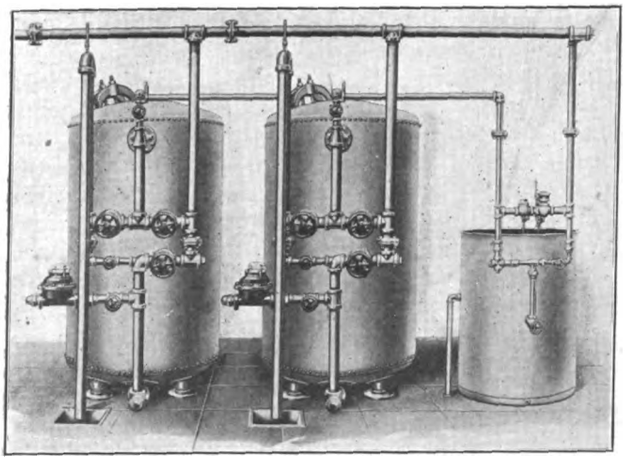


Fig. 5. A small two-unit vertical type zeolite water softener with brine tank, showing the simplicity and the small space required.

Character of scale	*Thickness in inches*	*Composition*	*Efficiency loss*
Hard	1/50	largely carbonate	5.4%
Soft	1/32	largely carbonate	7.2%
Hard	1/32	largely carbonate	8.5%
Soft	1/25	largely carbonate	8.0%
Hard	1/25	largely sulphate	9.3%
Hard	1/20	largely sulphate	11.1%
Soft	1/16	largely sulphate	10.8%
Soft	1/16	largely carbonate	11.0%
Soft	1/16	largely carbonate	12.4%
Hard	1/16	largely carbonate	12.6%
Soft	1/11	largely carbonate	15.0%
Hard	1/9	largely sulphate	15.9%

Loss of boiler efficiency, in its final analysis, means just one thing—wasted money.

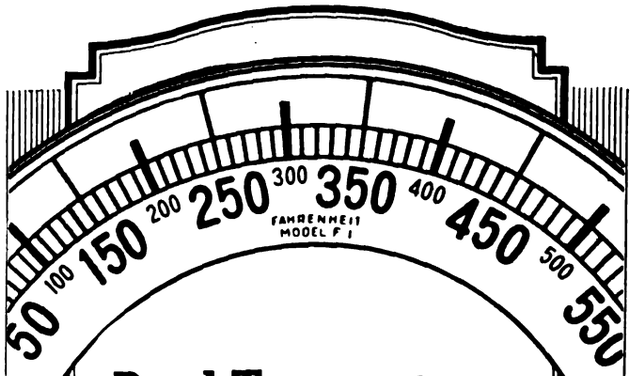
A layer of scale 1/50 of an inch thick, in boilers requiring twenty tons of coal per day, means a loss of about $1,500 in the course of a year, considering that coal costs $5 a ton.

The loss entailed by a layer of scale one fourth of an inch thick, with an attendant loss of efficiency of 30 per cent., is, of course, much greater. In that case the loss, in dollars, would be about $10,000 a year, considering that the boilers used 20 tons of coal a day at $5 a ton.

In the light of these disclosures, we need not wonder why scale is one of the greatest economic evils that besets power plants today, and we can readily understand why water free of scale forming ingredients is so desirable for boiler feed.

For all practical purposes, the direct effects of scale are so numerous and so great that the indirect effects are usually disregarded in capitalizing or charging off the cost of a water softener. Waste of fuel through decrease in boiler efficiency is a factor of such importance that even without other complications there is reason enough here for elimination of hard feed water.

The hardening substances found in water all contain the two elements or bases, calcium (lime) and magnesium. If these two hardening elements or bases are eliminated, the water is changed from hard to soft. It has been found that the element or base sodium does not give water the quality of hardness. Further, since a method has been discovered and perfected by which this base sodium can be substituted for the bases calcium and magnesium of hard water, this method has been termed base exchange. It is a process by which complete and automatic exchange of the bases mentioned



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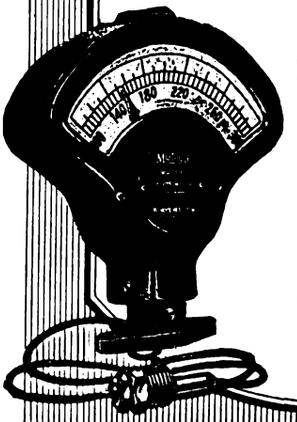
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above is brought about and is therefore a simple and very desirable process to install and operate.

This base exchange action is brought about upon the surface of a special mineral, commonly termed zeolite, although a better general term for the substance is base exchange silicate. During this process nothing is actually added to or taken from the mineral itself, which simply provides the properties and surface by and upon which the exchange action takes place. Therefore the mineral may be used permanently and is not a source of expense in the operation of this type of softener.

Sodium is the only cost item that enters into the operation, for naturally this must be supplied. This element is obtained through the use of common salt, which is cheap, clean, readily available and easily handled. The amount of salt required varies directly with the amount of hardness in the water. Water of average hardness, say 10 grains, requires 5 pounds of salt to soften 1,000 gallons. The average delivered price of salt being about $10 a ton, this represents a cost of two and one half cents for 1,000 gallons of soft water.

If hard water forms scale and soft water eliminates and prevents that scale, soft water will effect economies as great as the waste which can be traced, directly or indirectly, to hard water and scale. These savings are manifold, but the greatest of them are fuel savings and decreased cost of boiler operation and maintenance, together with improved boiler efficiency. In some cases this fuel saving amounts to as much as ten or twelve per cent. In other instances, where hard water costs have been reflected more in maintenance than in operating costs, the fuel saving will be smaller than the saving on maintenance costs.

That the base exchange water softener does accomplish the task which has been a thorn in the side of engineers for many years is indicated by the general acceptance of this device by hundreds of industries, power plants, textile mills, laundries, hotels and public institutions as well as homes.

Industry now is in a fair way to overcome the old disregard for its water supply. Years of experience with hard water, years of scanning red figures deposited by scale on the debit side of the book, have had their effect. Tomorrow, industry will appreciate the water supply for what it can be, a valuable asset.

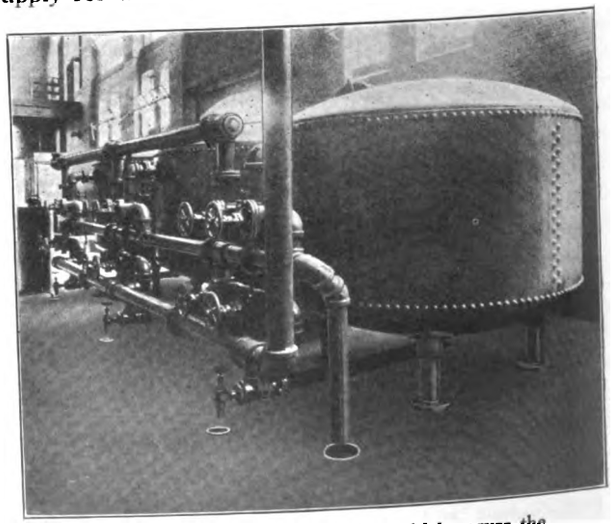
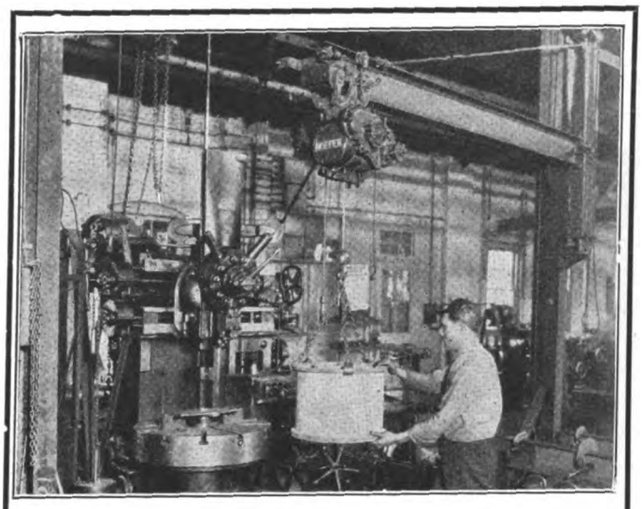


Fig. 6. This is the installation which serves the sewage disposal plant (Fig. 3) of the City of Milwaukee, softening and filtering river water for the boilers.

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For the Heavy Lifting of Materials, traveling cranes are the logical solution. One of these cranes is shown by the Harnischfeger Corporation, page 70.

A New Model Tractor is described on page 43 by the Mercury Manufacturing Company. The Trackless Train is known throughout industry as an efficient handling unit.

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Man Cooling Fans for the Hot Jobs. Many departments, where men work under excessive heat, can have good fresh air through the Man Cooling Fans, shown by The American Blower Company on page 86.

The Rapid and Continuous Conveying of machine parts, castings, etc., is shown on the Inside Front Cover by Standard Conveyor Company.

Wooden Truck Wheels, made to ease the loads of lift-truck or trailer and save fatcory floors, are described by Metzgar Company, Inc., page 76.

Steel Shelving for Storing Books, etc., is now being used to a great extent, because it saves space and helps in standardization of records and bookkeeping systems. See Durand Steel Locker Company advertisement, page 2.

A Vise with Renewable Steel Jaws and swivel base, at no additional cost is shown in detail by The Charles Parker Company. Page 66.

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Worm Gear Reduction Units for speed reduction suitable to all type of machinery is shown on page 102 by The Cleveland Worm & Gear Company.

A Gasoline Driven Locomotive Crane, powerful, speedy, yet suitable for a wide range of industrial uses, is shown on page 96 by the Koehring Company.

Variable Speed Control for transmission use is described on page 98, by The Reeves Pulley Company.

A Portable Loading Conveyor which can be furnished tractor tread or wheels for rapid mobility is shown handling coal, ashes and other bulk materials by the Barber-Greene Company, on page 5.

Saving of Steam and Power made possible by steam pipe and leak-proof joints. E. M. Dart Mfg. Company, on page 97, offer a booklet describing the special features of the Dart Unions which make this possible.

Elevators up to 60 Feet in Height have, through a new method, been standardized as to parts, size, etc. This assures quick delivery and lowering of costs. Described in "The Conveyor," a booklet offered by the Chain Belt Company, on page 104.

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Air Hoists are very economical where compressed air is used in a plant. Used for lifting and moving machine parts, castings and other materials. They are easy, safe and speedy. Illustrated and described by Curtis Pneumatic Machinery Company on page 100.

Stoker Fans that are in use by well known utility companies everywhere and suitable for industrial use are shown pictorially by the Buffalo Forge Company, page 35.

Metal Partitions for office and factory use are gaining favor daily. The Sanymetal Products Company on page 88.

Coal Handling Systems from complete installations to minor accessories, such as gates and spouts, are described by Gifford-Wood Company, page 38.

Electrical Motors for use where a very heavy starting torque is required, are explained in Bulletin 29 offered by Century Electric Company, page 67.

Temperature Control and Heat Regulation is now necessary in every industry. Information on this subject can be had from Taylor Instrument Companies, page 103.

Industrial Electric Trucks and Tractors for reducing shop transportation costs are shown on page 49 by The Crescent Truck Co.

Data on the Storing and Rehandling of Coal, Ashes and other bulk materials can be obtained from C. W. Hunt Company, Inc. See page 30.

Drills Chucks of Exceptional Features are described on page 73 by the Jacobs Manufacturing Company.

Data on Preventage of Belt Slippage and saving of space between pulleys on all types of belt driven machines can be secured from F. L. Smidth & Co., page 78.

Rolling Doors for Industrial Plants, Warehouses, Garages, etc. Page 42, Cornell Iron Works.

Pressed Steel Hangars for Transmission requirements are described by The American Pulley Company, page 62.

Concentrated Lighting as an aid to production. See American Fixture Company advertisement, page 97.

Bulletins describing Water Tube Boilers are offered by The Wickes Boiler Company, page 100.

Catalog on Water Coolers and Sanitary Fountains can be obtained from Manufacturers Equipment & Engineering Company, page 99.

An Electric Hoist with automatic stop for safe operation of 500 to 1000 lb. capacity is shown on page 51 by Reading Chain & Block Corp.

Free Bulletins on Air Filtration for general ventilation and special industrial purposes can be obtained from Reed Air Filter Company, page 48.

How the Electrical Industrial Truck saves labor, time, and provides additional floor space is described on page 24 by The Yale & Towne Mfg. Co.

Data on the Measurement and Weighing of Materials is described on page 6, Toledo Scale Co.

Fractional Horse-Power Motors. Data and advice is offered by Wisconsin Electric Co., page 95.

$100.00 in Gold is being offered by C. F. Pease Company, manufacturers of Blue Printing Machinery. See page 75.

Stokers as an Aid to Lower Fuel and Steam Costs are described in "Coal—the Basic Fuel." Issued by Stoker Manufacturers Association. Page 22.

Special Features of the High Speed Chain Hoist are shown by Wright Manufacturing Co., page 98.

The Latest Book on Crane & Derrick Hoists, Speed Reducers, Back Geared Electric Motors, Contractors and Hauling Winches is now ready for distribution by Shepard Electric Crane & Hoist Co. See back cover.

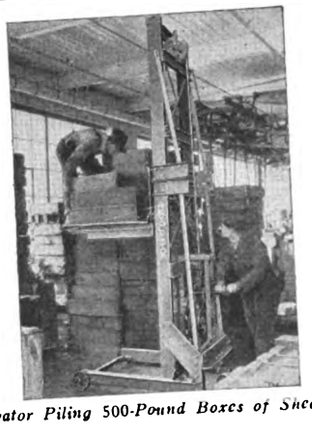
Gas Plants for Heating, Heat Treatment and other industrial process work are described by Smith Gas Engineering Co., page 44.

Complete Information on the Small Motor-Driven Vacuum Pump is offered by Nash Engineering Company, page 10.

Production Counters. Special offer by Durant Mfg. Co., page 76.

Pressed Steel Boxes that hold parts ready for the lift truck and used for shortage purposes. Described on page 83 by Truscon Steel Company.

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Rust Prevention. Special Trial offer by The Rusticide Company, page 94.

Consulting Service on Conveyor Handling of material is offered by The Brown Hoisting Machinery Company, page 3.

Valuable Data of Electrical Protection can be obtained in "The Handbook of the U-Re-Lite (96 pages, fully illustrated). See The Cutter Company advertisement, page 8.

First Aid Treatment, necessary in all industrial plants. See Cresog Laboratories Company, page 52.

Mechanical Drive Turbines for industrial use are described in leaflet 3907 B, issued by Westinghouse Electric & Manufacturing Company, page 36.

Precisoin Heavy Duty Bearings for heavy machinery. See Norma-Hoffman Bearings Corporation advertisement, page 64.

Comparative Figures of Handling Costs of coal by the Scoop Conveyor and by man power only is shown by Portable Machinery Company, page 72.

The Choice of a Storage Battery for industrial trucks and the facts necessary for consideration is given in Form 1874, issued by the Electric Storage Battery Company, page 26.

Easton Car & Construction Company, manufacturers of industrial railway equipment, announce the opening of the new plant in Kansas City. See page 64.

Better Light for interiors of plants is described by The Skybryte Company, page 56.

Pressed Steel Handling and Conveying Equipment, platforms, etc., are described on page 96, Powell Pressed Steel Co.

Feed Water Regulation on boiler equipment that saves property and protects life is shown by the Chaplin-Fulton Mfg. Co., page 95.

Gears of all kinds for industrial use are manufactured by W. A. Jones Foundry & Machine Company. A special bulletin No. 30, describes the complete line. See page 58.

Electric Hoists particularly adaptable to shop operations are shown on page 91 by Roeper Crane & Hoist Works, Inc.

"Electrical Heat is Frequently the Better Way" is the title of a booklet issued by General Electric Company, page 28.

An entire plant operated by five men through the installation of mechanical handling equipment, is described by The Jeffrey Mfg. Co., page 20.

For High Efficiency where high speed is required, the iron and steel pulleys, shown on page 34, are recommended by The Medart Company.

Handling heavy materials, such as iron and steel, coal and other bulk materials, and for other yard work, the locomotive crane shown on page 41 by McMyler-Interstate is economical and dependable.

Sheet Metal Products in steel, iron, brass, copper, monel metal, etc., are made by The Breese Company. See page 56.

Materials Handling Trucks, tractors and cranes, are described in literature issued by The Baker R & L Company, page 96.

A Way to Handle Chips and Refuse is suggested by the Elwell-Parker Electric Company, makers of the electric tractor. See page 18.

Reading temperatures from 40° to 750° F. at any distance is possible with the MOTOCO Industrial Thermometer, made by The Moto Meter Co., page 89.

Adjustable Pipe Hangers that can be used for any size pipe is fully described in the 120 page catalog issued by Grinnell Co. See page 25.

Piling and Tiering machines have shown a way to save wasted storage space and have become a necessity in handling materials. See Revolvator Co. advertisement, page 94.

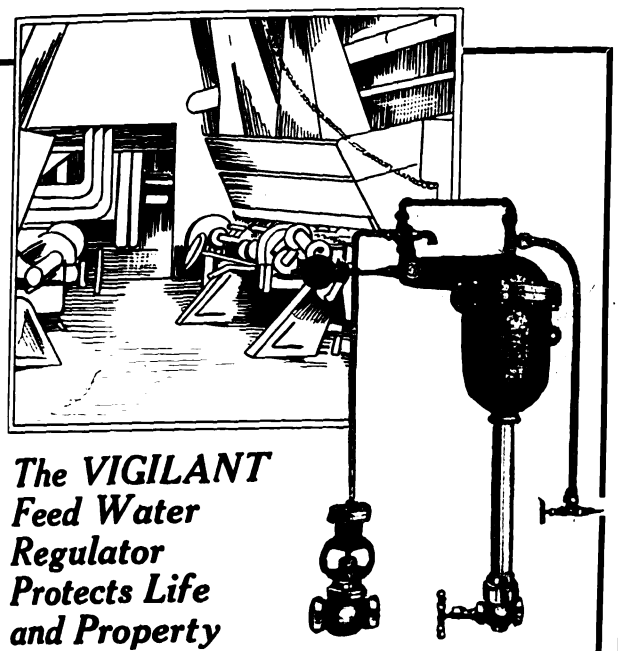
Removable Disc. Valves have brought maintenance cost down to a minimum. Jenkins Bros., page 82, describe such valves.

Data on a paint that resists intense cold, heat, acids and fumes, is being issued by The Nitrose Company. See page 50.

Structural Steel Buildings, shipped ready for erection, with a choice of various types of doors, sash windows, etc., for all conditions, is described in an illustrated catalog, "Choice of a Thousand Buildings," issued by Milliken Bros. Mfg. Co. See page 50.

Careful Choice of Hangers for Sliding Doors are important

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The VIGILANT Feed Water Regulator Protects Life and Property

A Vigilant is the best investment you can make. By controlling the proper water level of your boiler feed water at all times, the Vigilant Regulator assures safety and economical boiler room operation. It works by gravity—no floats, tubes, diaphragms to get out of order. It is the simplest and easiest operating feed water regulator in use.

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LAY Metal Case BROOMS



OVER 90% of the steel industry; 40% of the railroads and over 4,000 industrial plants use Lay Brooms.

From handle to the extra broad sweeping tip, they are built of the best. Note the metal case clinched with staples, the broad re-enforcing band, and the two sewings of linen twine. Lay brooms hold their shape without shed or spread till worn to the last stub. A broom for every purpose, write for descriptive price list.

The JOSEPH LAY CO.
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New York Office - - - - - - 110 W. 34th Street



Clipping The Hair Of A Nation!

TODAY, in thousands of busy barber shops, men ease themselves into friendly chairs and have their hair cropped in a better, quicker way by an electric clipper. Thanks to the fractional horsepower motor—which made this ingenious device possible—another visionary possibility has become a practical reality. Thanks to Dumore fractional horsepower motors and to Dumore advisory engineers, the Moore Electric Hair Clipper—pioneer of them all—has won and retained the leadership of its field.

Perhaps our Engineering Department can do for you as they did for Moore. The personnel of this department have for years been accustomed to adapting fractional horsepower motors to new applications. If you are developing a motor driven device, tool or appliance and find a perplexing power problem retarding its success—or if you are a manufacturer planning to change the power unit you are now using, you will find the advice of these experts to be extremely useful. Write them any time—they welcome problems that aren't easy.

WISCONSIN ELECTRIC COMPANY
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Type-SAX
⅛ h. p. motor with special base. Operates on A. C. or D. C.

Type-A—Stripped
⅛ h. p. Cast iron frame, enamel finish, Babbitt bearings, wick oil feed. Operates on A. C. or D. C.





Type-D
⅛ h. p. Cast iron frame. Enamel finish. Plain bearings. Grease cups. Operates on A.C. or D.C.

No. 3GM—Stripped
¼ h. p. Aluminum frame. Enamel finish. Norma Bearings. Ventilated. Operates on A. C. or D. C.



Dumore
Fractional H.P. Motors

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BAKER Industrial Tractors and Trucks turn virtually within their own length.

Their speed, strength and flexibility enable one man to perform the work of from five to twenty hand truckers with no change in your present layout.

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CLEVELAND, OHIO

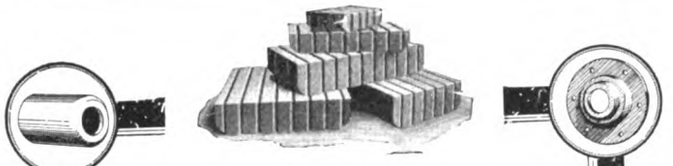
Send for complete, descriptive bulletins covering all models of Baker material-handling tractors, trucks and cranes.



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WHEREVER materials are handled by hand or electric lift truck, Powell Platforms and other equipment will decrease production costs and effect big economies in shop operations.

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KOEHRING HEAVY DUTY

FOR the economical handling of coal, ashes, raw materials and machinery, the Koehring Gasoline Crane has the power, speed of operation, flexibility of control and traction mobility for the widest range of service in industrial plants. *Write for Crane Bulletin No. CE-16.*

Crane Capacities

No. 1—10 tons at 12 ft. radius ¾-cu. yd. clam-shell bucket, sand or gravel, at 30 ft. radius. Boom lengths to suit conditions. 4-cyl., 5x6 in. gasoline engine, 1,000, R.P.M

No. 2—15 tons at 12 ft. radius. Handles following loads, sand or gravel, (clam-shell buckets) ¾-cu. yd. at 43 ft. radius, 1 cu. yd. at 37 ft. radius, 1¼ cu. yd. at 32 ft. radius. Boom lengths to suit conditions. 4-cyl., 5½x7 in. gasoline engine, 925 R.P.M.



KOEHRING COMPANY
Pavers—Mixers—Gasoline Cranes, Draglines and Shovels
MILWAUKEE, WISCONSIN
Sales Offices and Service Warehouses in all principal cities
Foreign Dept., Room 1270, 50 Church St., New York
Canada, Koehring Company of Canada, Limited, 108 Front St., East, Toronto, Ontario
Mexico, F. D. Lapum, Cinco de Mayo, 21, Mexico, D. F

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where these doors are constantly used. Such hangers and the trolleys used are shown in an installation described on page 14 by Richards-Wilcox Mfg. Co.

A Special Catalog on conveyor weighing is being issued by Merrick Scale Mfg. Co. See page 64.

Brooms for industrial purposes, made extra heavy, is shown by The Joseph Lay Company, page 95.

The Standardized Crane is a feature with the crane described on page 56 by Northern Engineering Works.

A New Single Phase Motor, The Type SCR, made in sizes up to 10 H. P., is shown on page 68 and 69 by the General Electric Company.

A Coating for Windows that prevents eye-strain and allows no glare, shadows, nor sweltering heat to enter the factory, is an aid to production. Park Chemical Company, page 74, who manufacture Bluee, have a special free trial offer on this product.

A Portable Conveyor operated by a 3 Horse Power Gasoline Engine with clutch or electric motor is shown on page 91 by Chicago Automatic Conveyor Co.

Pneumatic Conveying is more often the ideal system for handling and conveying soda, ash, lime and many other bulk materials. This system is described by the Dust Recovering & Conveying Company, page 16.

Shoes Especially Adapted for Industrial Use that are waterproof, acid-proof, and heat-proof are described by the F. J. Stahmer Shoe Company, page 82.

Industrial Gloves suitable for factory use is shown on page 81 by the Spartan Glove Co.

Pressed Steel Containers that are guaranteed for years of service are shown by the Seamless Steel Products Company, page 57.

Vacuum Cleaning Factory Interiors is saving costs in labor and time. Also used for the reclaiming of valuable material. See Invincible Vacuum Cleaner Mfg. Company advertisement, page 54.

Your Hauling Problem may be solved by a Fordson Tractor Locomotive or a Ford Ton Type Locomotive. These are described and illustrated by Brookville Truck & Tractor Company, page 46.

Store Room and Office Systems that keep records of tools, etc., is described in the booklet "Getting the Drop on Competition," issued by The McCaskey Register Company, page 59.

A Ten Ton Three-Motor Traveling Crane is shown on page 37 by the Whiting Corporation and used in a foundry. This may suggest a similar use in your own plant.

Lift Trucks and Steel Bound Platforms suited to every kind of loads in an industrial plant is shown on page 79 by the Stuebing Truck Company.

Self-Aligning Ball Bearings and Ball Bearing Hangers that save 59 per cent. of its cost in lubrication alone is shown by The Skayef Ball Bearing Company on page 4.

Metal Buildings with Patented Interlocking weather-tight joints and other special features are described by Maryland Metal Building Company on page 9.

Samples of Various Degrees of Lead are offered by the American Lead Pencil Company, page 81.

Flexible Shafting for Motor Belt and Rope Drive for use in driving belting and other shop operation is shown on page 76 by the Stow Manufacturing Company.

Transmission Equipment that Saves Power is described in a book called "Facts" issued by the Dodge Manufacturing Corp., page 60.

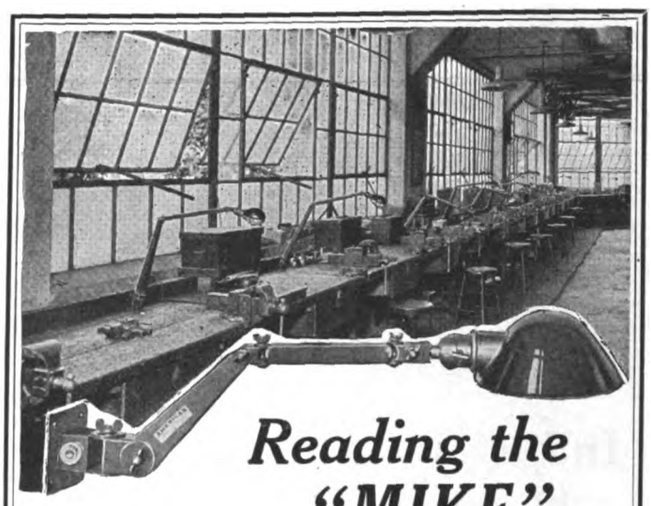
A Portable Bucket Loader at an extremely low price is shown on page 92 by Link Belt Company.

High Speed Wood and Metal Band Saw Blades and also heavy duty machine saws are described on page 99 by Racine Machine & Tool Company.

Line Shaft Ball Bearings saves power, cut maintenance and lubrication costs. Bulletin number 130 on this subject is offered by the Hyatt Roller Bearing Co. See inside back cover.

Savings Effected in Materials Handling is described in the tier-lift truck advertisements on page 40 by Lakewood Engineering Co.

Underfeed Stokers that carry over-pads of 200 per cent. are illustrated on page 99, Detroit Stoker Co.



Reading the "MIKE"—



"American" patented full universal joints used on all connections in the arm.

Watching the cut, that's when concentrated lighting plays its part in aiding your lathe hands to keep production at its peak.

Use less overhead lighting and more concentrated lighting, with American Lighting Fixtures! Get the benefit of all the light you pay for! American Fixtures allow any adjustment desired for concentrating the light exactly where needed. The scientific reflector diffuses a soft non-glaring ray that's kind to the eyes.

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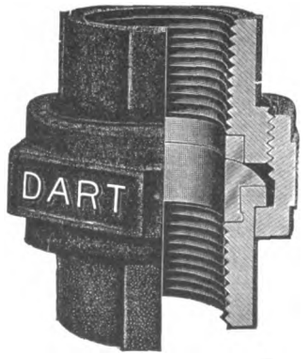
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that spring a leak through any defect in material or workmanship are immediately replaced by two of the same size without charge. We know they stay tight because of their *Bronze* to *Bronze* seat rings, machined to a true base and the joint properly ground.

We will send you a free sample with booklet and price list, then judge for yourself.



Write for sample, catalog and price list.

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Providence, R. I.

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THE FAIRBANKS CO.

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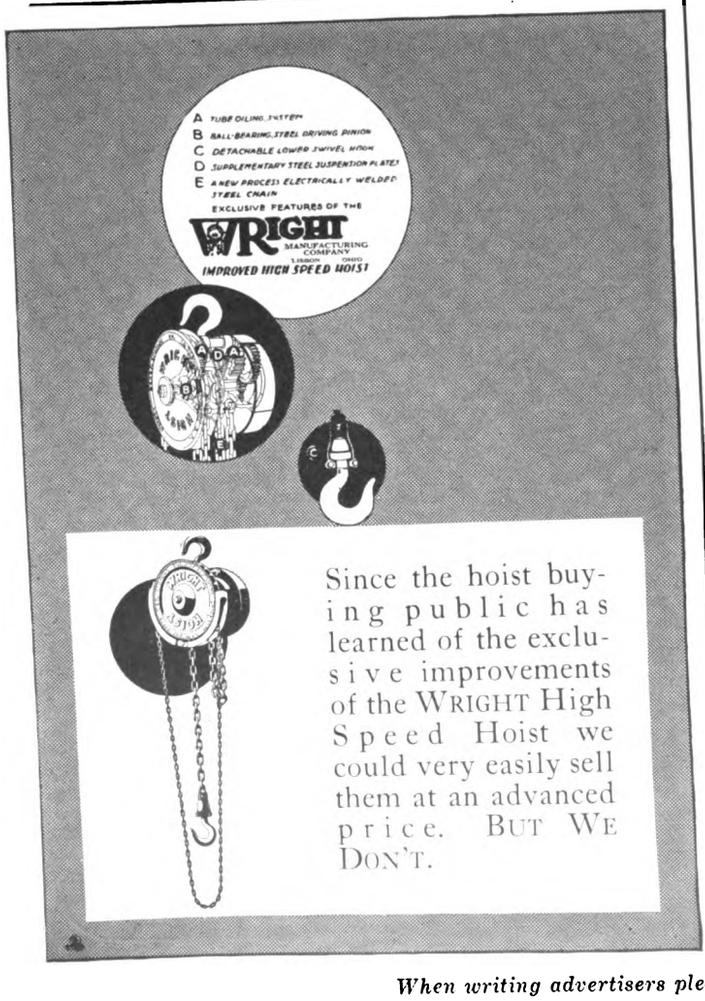
Industry Comes to Reeves for Accurate Speed Control!

THE world's first variable speed transmission was designed and built in the Reeves plant, 27 years ago. Each succeeding year has revealed new uses and increasing needs, until today it is recognized in every line of industry as the only truly accurate and dependable method of variable speed control. Write for details and full information.

"The Reeves" VARIABLE SPEED TRANSMISSION

REEVES PULLEY COMPANY

COLUMBUS, INDIANA

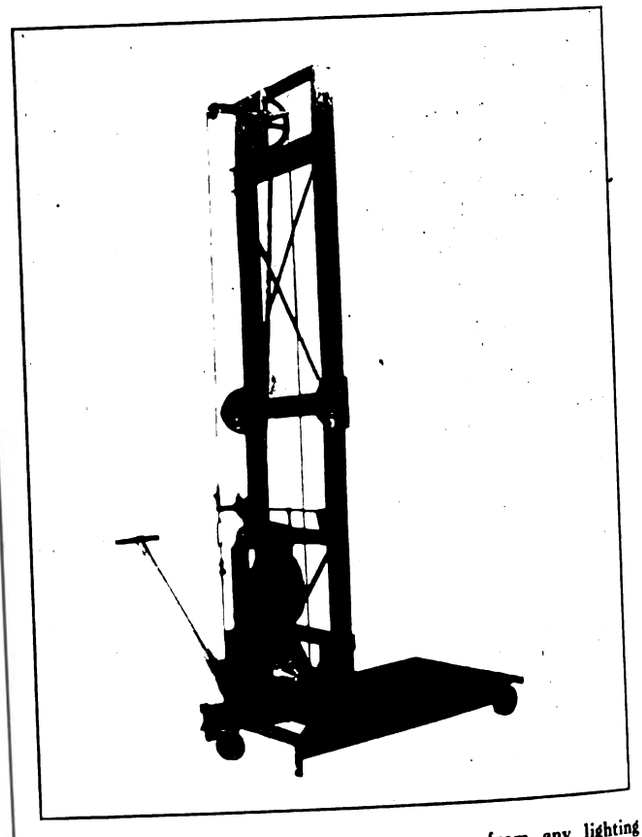


New Light Duty Tiering Machine Operates from Lighting Circuit

THE Lewis Shepard Co., of Boston, Mass., have just placed on the market a new, light duty, worm driver stacker, having a capacity up to 1,000 lbs.

The motor is ½ hp., which makes possible a lifting speed ranging from 9 ft. per minute on 1,000 lb. capacity stackers, to 14 ft. on 500 lb. capacity stackers. A "dead-man" type of controller is used, and there are limit stops at both top and bottom. The stacker can be equipped with an elevator type of control, allowing the operator to ride up with the load and stop the lifting platform at any desired height.

Other construction features are the lifting and steering handle, which elevates the front feet of the stacker



A new light duty stacker which operates from any lighting circuit and is easily moved from point to point.

not less than 1¼" above the floor, and after elevating, the handle can be used for steering when in any position. A pipe handle of convenient length is standard equipment to facilitate the lowering of the upper section without danger of injury.

This stacker can be operated from any lighting circuit and is found very convenient in many different lines of business. It is not only used for piling and unpiling of materials, but as a handy tool for work around the ceiling, such as the hanging and oiling of shafting and motors.

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RACINE

Fifteen Years of Specialization

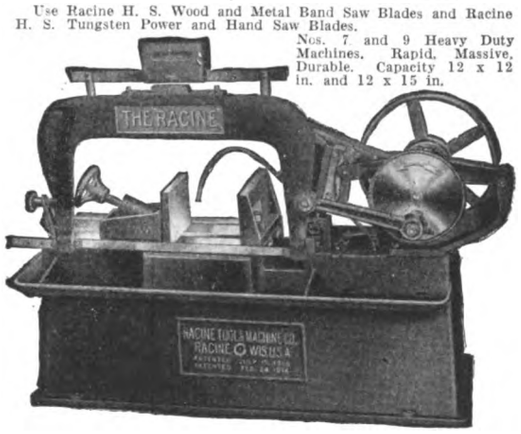
Put your cutting problems up to us. Whatever the material, our engineers will chart the work with recommendations that will enable you to do it most satisfactorily—most economically. No charge—No obligation.

The Racine line is complete. Capacities 4 to 15 inches, belt or motor driven. Many machines for special purposes. Bulletins sent on request.

RACINE TOOL & MACHINE CO.
RACINE Dept. 12 WISCONSIN

Use Racine H. S. Wood and Metal Band Saw Blades and Racine H. S. Tungsten Power and Hand Saw Blades.

Nos. 7 and 9 Heavy Duty Machines. Rapid, Massive, Durable. Capacity 12 x 12 in. and 12 x 15 in.



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INDUSTRY'S FIRST CHOICE

Over 8000 companies in 200 lines of industry are using MEECO Coolers to increase the efficiency of their workers during hot weather.

MEECO Coolers use less ice per man per season than other types because the tank and coil are scientifically designed to supply more men on each charge of ice.

The MEECO guard-bowl and slant-stream bubbler insure positive sanitation. No MEECO Cooler has ever worn out. Many have done steady service for over fifteen years.

Why not give your men the vital benefit of clean, cool drinking water and save many dollars a year on every worker you employ? Now is the time to investigate this saving. Why not write us today?

Complete Catalog Gladly Sent On Request

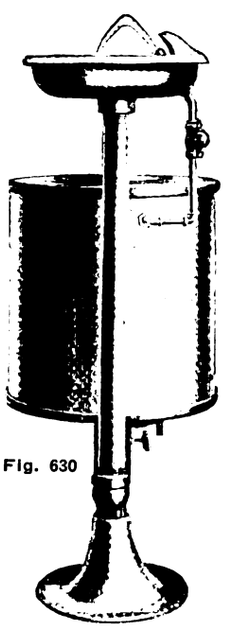
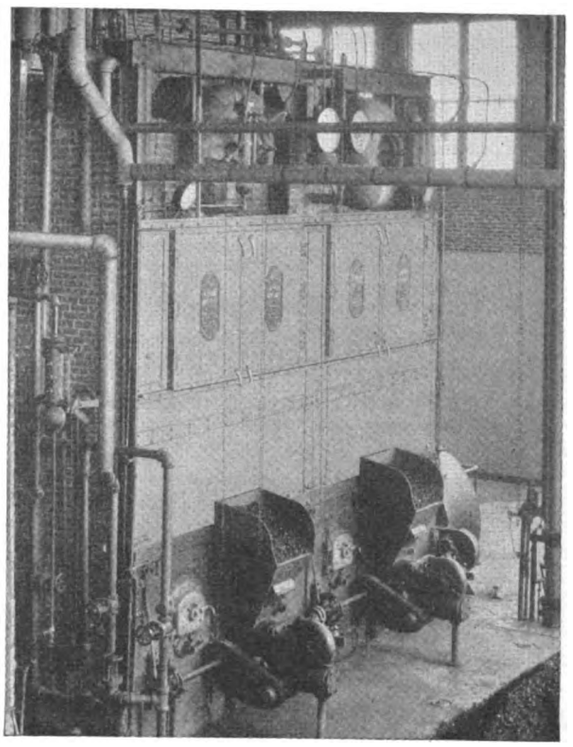


Fig. 630

Lockers Sanitary Washbowls — METAL MEECO PRODUCTS — *Shelving Chairs Partitions*

MFG. EQUIPMENT & ENGINEERING CO.
Originators and World's Largest Makers of Ice-Cooled Drinking Fountains
FRAMINGHAM, MASS.



The ability of the Detroit Underfeed Stokers to carry overloads of 200% at high efficiencies, has enabled the Maumee Finishing Co of Toledo to carry their plant on two boilers —thus effecting a material saving over former practice when several additional boilers were required.

Mr. Gibbons says:

"Our new boilers and Stokers have fulfilled the requirements to our entire satisfaction. With the new equipment we are able to handle nicely the high overloads which we require frequently."

Write for Bulletin No. 229

DETROIT STOKER CO.
229 General Motors Bldg.
Detroit, Michigan

DETROIT UNDERFEED STOKERS

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Air for Lifting and Moving

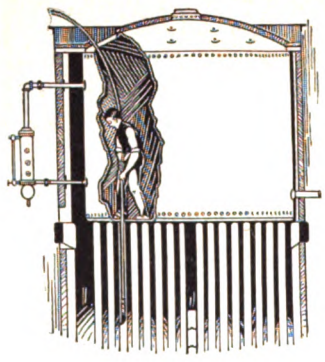
For lifting and transferring heavy materials, use Curtis All-Steel "One Man" Air Hoists and I-beam Trolleys. Easy, speedy and safe—costs no more than a good chain block. Economical, because they utilize the compressed air usually available in most plants—save man power and help keep production up to schedule.

Furnished in capacities up to 20,000 lbs. and in various types to meet particular needs. Send for complete data.

CURTIS PNEUMATIC MACHINERY CO.
1668 Kienlen Ave. St. Louis, Mo.

CURTIS Air Hoists and Trolleys

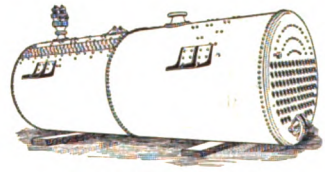
Vertical Water Tube



Man Stands Erect Cleaning

WICKES Steam Boilers

Ask for Bulletins describing in detail—sent free.



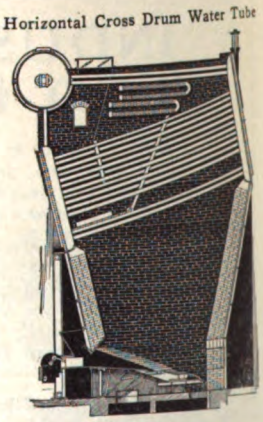
Horizontal Return Tubular

THE WICKES BOILER CO.

Saginaw, Michigan

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Chicago, 76 West Monroe St. Seattle, 736 Henry Bldg.

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INDUSTRY ILLUSTRATED

Wouldn't you give it a hearty welcome?

Wouldn't it put a dash and a sparkle into the daily grind you have always wanted—but which you have found hard to get?

And ***wouldn't*** it be worth to you many times what it costs?

This coupon is for YOU—use it NOW

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120 West 32nd Street, New York

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Pruning Industry's Excess Variety

Steps Taken Toward Simplification

SECRETARY HOOVER, the Department of Commerce, and the Chamber of Commerce of the United States, together with numerous committees drawn from a variety of industries, as most of us know, have been working for "Simplification" as a fruitful means of waste reduction.

A report just issued by E. W. McCullough, manager of the Fabricated Production Department of the United States Chamber of Commerce, which has this problem in hand, contains some interesting information as to what has been accomplished. From this report we are quoting the following, and reproducing two illustrations.

"That simplification is extending throughout American industry is well borne out by the trend during the past 12 months. The steady increase in the number of lines either completing their simplification or actively working out the details of their programs, together with the more rapid decrease in the number of lines uninterested is an encouraging situation. There undoubtedly will be always a number of commodities not amenable to simplification and standardization, but that they are a very small percentage of the whole is seen from the chart.

"Among the 340 lines investigated, the articles produced extend from carpet tacks to farm implements. It has been found that there is practically no industry which is not more or less burdened with over-diversification. Even in those lines where the style factor militates to a certain extent against any reduction in varieties, much attention is being given to the simplification possibilities.

"The question may very properly arise as to how simplification and standardization can be carried out.

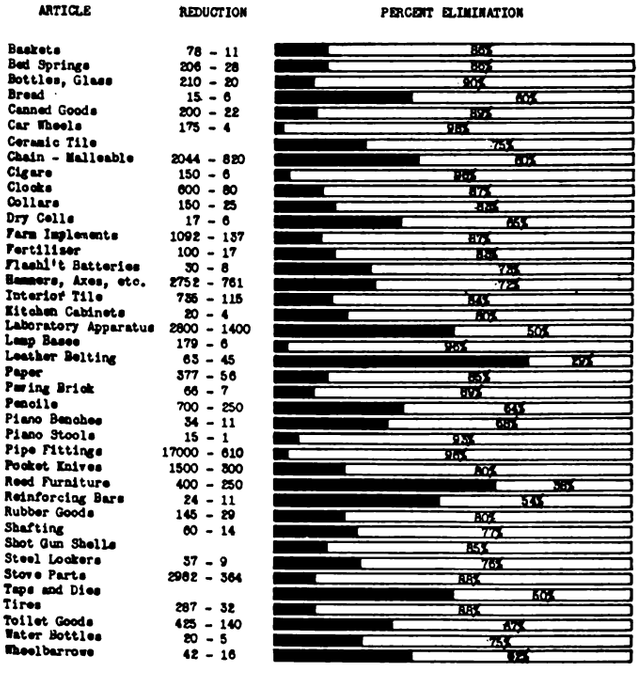


Fig. 2. Here are some of the practical accomplishments of simplification—at no loss to individuality or originality.

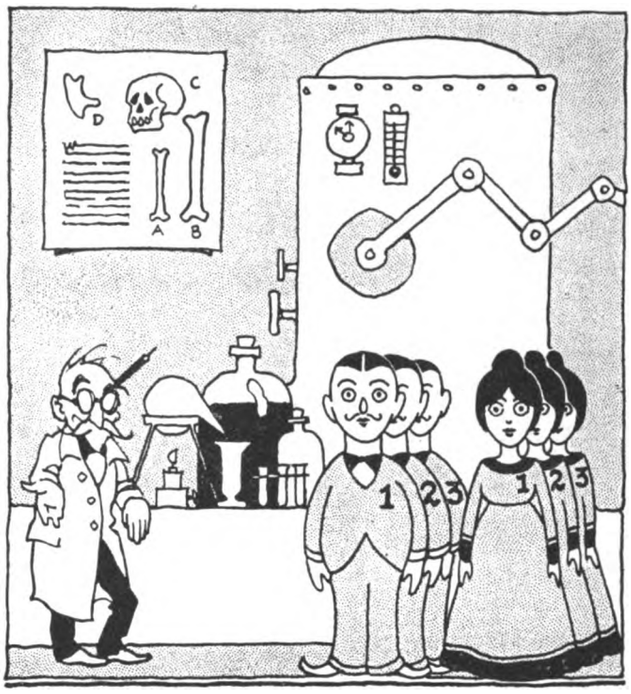


Fig. 1. This is what some highly imaginative pessimists think is the final ideal of the advocates of standardization.

Several methods suggest themselves:

(1) Through Individual Efforts
(2) Through Trade Associations
(3) Through Coöperative Efforts of Unorganized Lines
(4) By law

"There are striking examples of the success of all of these methods. A great many manufacturing establishments have individually reduced the sizes, styles and varieties of their respective products and are blazing the trail for their competitors.

"As a trade association activity simplification has been immeasurably valuable.

"Coöperative efforts have also been secured within unorganized lines to bring about simplification. Several industries are at present developing the data and information preliminary to eliminating the excess varieties and setting up reasonable standards.

"A very effective, but not always desirable, method of simplifying a line and creating standards is by Federal law. Prominent among such enactments is the Standard Container Act, which, among other things, established the standards for Climax or Grape Baskets.

"As to the relative effectiveness of these several procedures, there is no real means of establishing a basis for comparison. The particular situation within an industry properly governs the method to be followed. The ultimate objective is identical—the elimination of waste with a corresponding benefit accruing to the producer, distributor and consumer.

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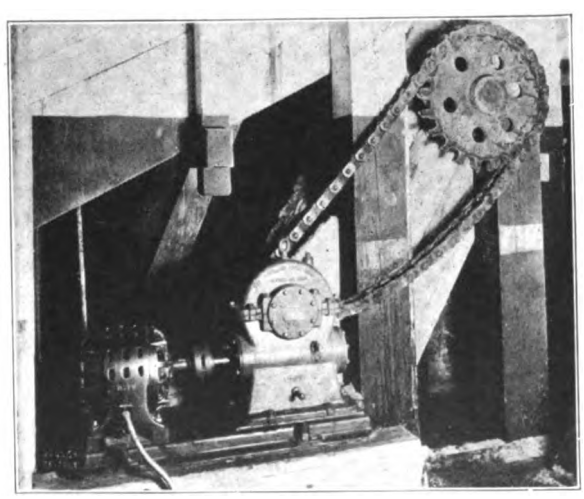
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Y

Yale & Towne Mfg. Co. 24

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Cleveland Worm Gear Reduction Unit driving Sawdust Conveyor in Lumber Mill. Motor 7½ H. P. 1200 RPM. Speed Reduction 60-1

The value of Experience counts for more when it becomes specific Experience covering a particular industry. It is the latter kind that we possess, based on more than twelve years of exclusive concentration on the problem of Worm Gear Speed Reduction.

To those interested we will be pleased to send a survey of the use of Cleveland Worm Gear Reduction Units as applied to Gas Producers.

There is a Cleveland representative close to you who will be pleased to call.

Cleveland WORM GEAR REDUCTION UNITS

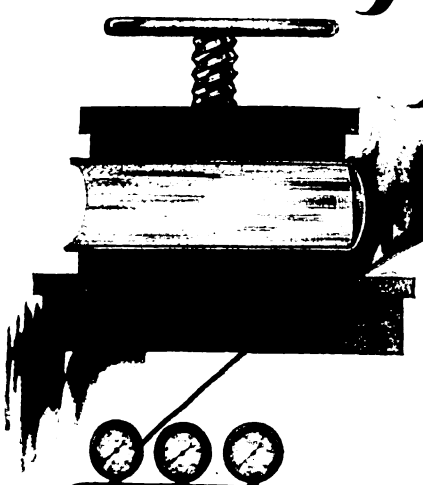
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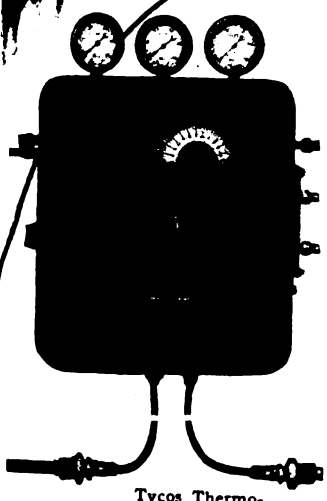
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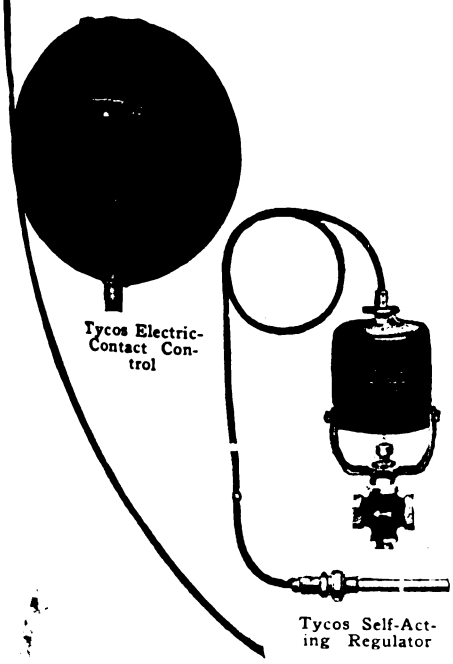
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EVER since Hyatt line shaft bearings were first installed in 1891, progressive manufacturers have enthusiastically endorsed them.

For 34 years these bearings have been saving power, cutting maintenance and lubrication costs, building up a nation-wide reputation for long life without repairs.

In 1891 Hyatt bearings were installed in the plant of the Greenfield Tap and Die Corporation, Greenfield, Mass. Mr. F. W. Woodrow, Mechanical Superintendent, recently stated:

> "When our machinery was moved to our new plant in 1921 the shafting and Hyatt bearings, after 30 years of steady use, showed no apparent wear.
> "After being cleaned they were put in use again and now operate as economically and smoothly as ever. There is every indication that they will run for 30 years more."

At the plant of the United Shoe Machinery Company, Beverly, Mass., 4,000 Hyatt line shaft bearings have been eliminating friction and saving power since 1904.

Other well known users and enthusiastic boosters are:

Ford Motor Co., Detroit, Mich. . .	21 years
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Rosemary Mfg. Co., Roanoke Rapids, N. C.	25 years
Norwalk Iron Works, So. Norwalk, Conn.	31 years

Large and small manufacturing concerns throughout the United States have found Hyatt line shaft bearings big factors for economy. Like savings are yours too as soon as you install the bearings in your plant.

'Phone the Nearest Mill Supply Dealer

Write for a copy of Bulletin No. 130. It will tell you all about Hyatt line shaft bearings, and what they can do for you.

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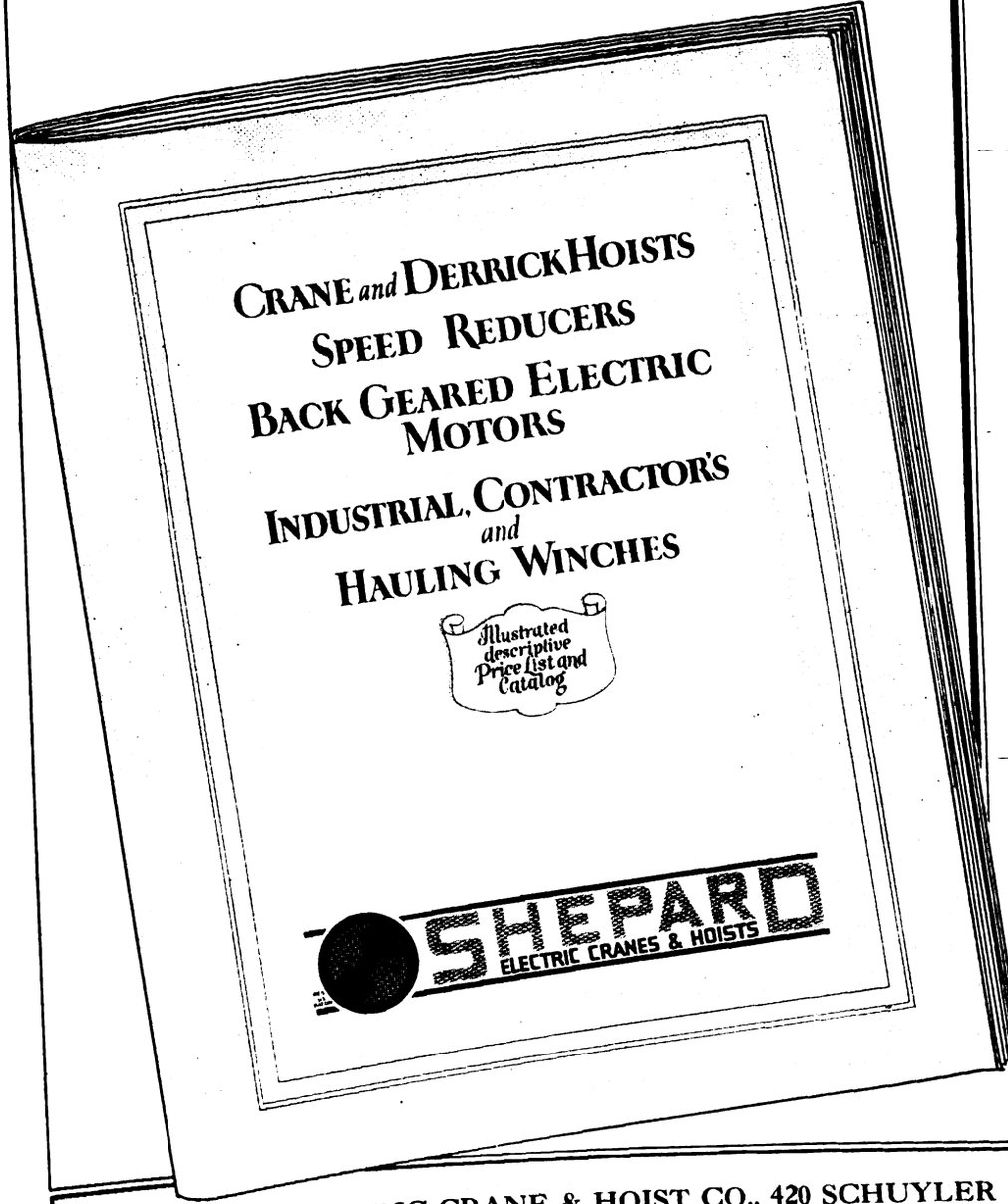
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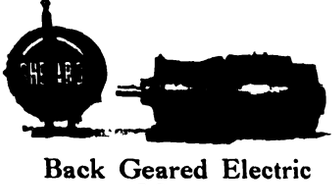
For years these have been Shepard Products



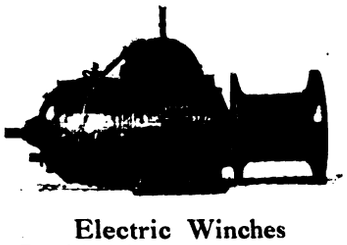
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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



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How to reduce the everyday wastes of power, water, light, heat and compressed air.

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By Earl Christmas

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By Allen F. Brewer

Factors which determine the kind of lubricant for best service.

The Art of the Automatic Fireman

By Francis Juraschek

The characteristics and applications of different types of automatic stokers.

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To Be On Time—Or Ahead
The Daily Aim of Any Newspaper

To get the paper out on time or a little ahead requires a close schedule and high pressure during working hours.

Above is a picture of the composing room of the St. Paul Daily News. The Standard Tube System of this paper connects the advertising department, the copy and editorial desks, and the composing room; making of them a unit. It places the workers of each department at the elbows of the other. There is no time lost by needless running from floor to floor, nor by misplacing of written material.

The Philadelphia Inquirer, The Public Ledger, Miami Daily News, and the Milwaukee Journal are some other well known papers who use Standard Tube Systems to help them speed up the day's work.

Publishers are makers and sellers of news. Industries are makers and sellers of goods. The problems of both are essentially the same, that is to save time, save labor, to eliminate error; to produce their product at a reasonable cost, and to make a reasonable profit.

Standard Pneumatic Tube Systems are akin to the telephone. What the telephone is to conversation, the tube system is to written things.

The benefits of either to industry are not questioned.

Let us send you Catalog S-7 which tells how Tube Systems aid many industries.

SUPPOSE YOU ARE NOT SURE

Let us assume that you would like to know what benefit a tube system or conveyors would be in your business.

Yet you do not want to place yourself under obligation by calling on the makers of such equipment.

To just such men, we address this invitation. It is part of our day's work to tell an industry whether it can or cannot use equipment such as we make.

We are as likely to say "No" as "Yes"—depending on the report of the competent engineer who studies your situation.

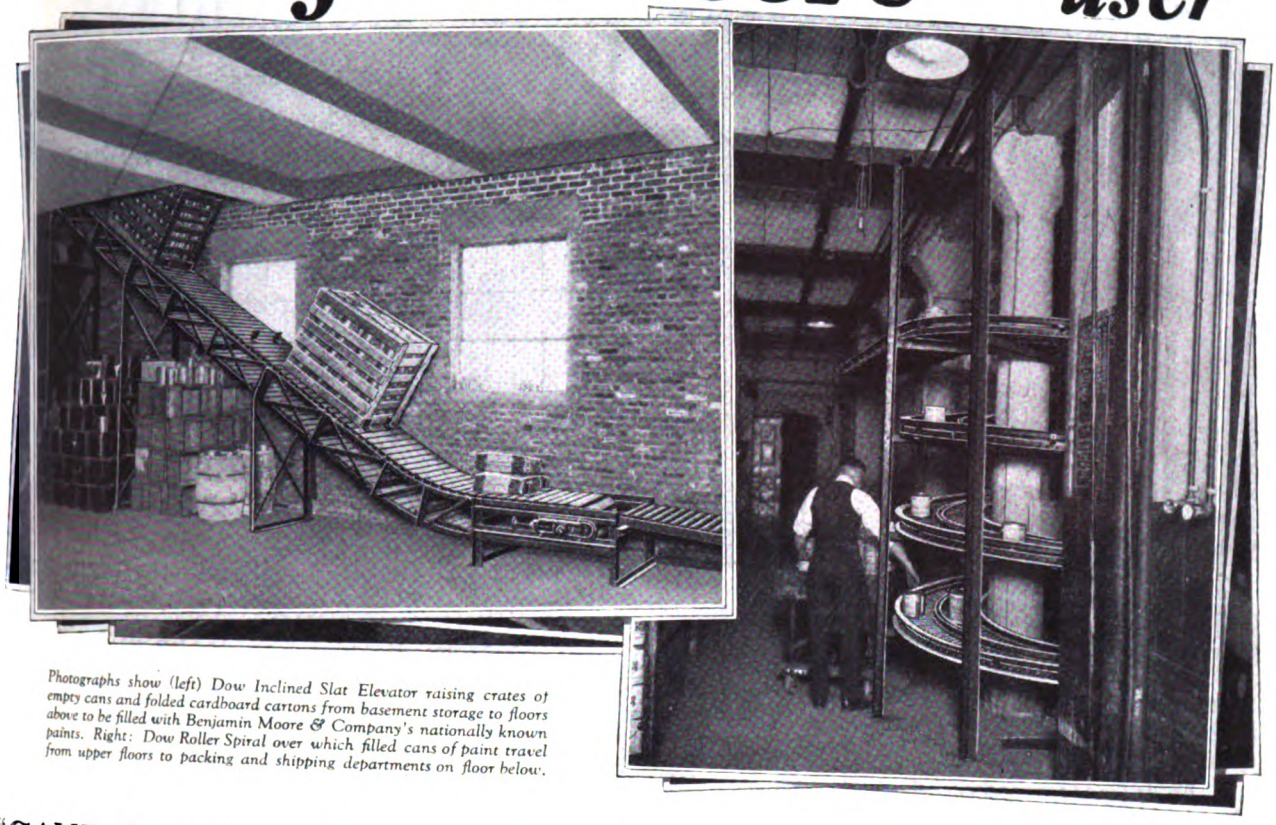
We will be pleased to have you call us in.

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Benjamin Moore — another user



Photographs show (left) Dow Inclined Slat Elevator raising crates of empty cans and folded cardboard cartons from basement storage to floors above to be filled with Benjamin Moore & Company's nationally known paints. Right: Dow Roller Spiral over which filled cans of paint travel from upper floors to packing and shipping departments on floor below.

"SAVE the surface and you save all"—save needless expense in your material-handling operations and you automatically establish a greater earning capacity for your business. Benjamin Moore & Co. are doing both. Their long established line of paints is conserving and enhancing the appearance of physical property the country over—their Dow Conveyors are contributing to increased earnings by actual savings in time, labor and money. Paints, piston rings or pickles—what is *your* business? It really makes no difference. For Dow Conveyors can be profitably used by practically every known industry. Ask our nearest office.



Just as the well-known paints of Benjamin Moore & Co., Brooklyn, New York, are conserving physical property, Dow Conveyors are conserving physical labor in varied lines of industry everywhere. In each instance the result is economy—an element of vital importance in the conduct and development of every business.

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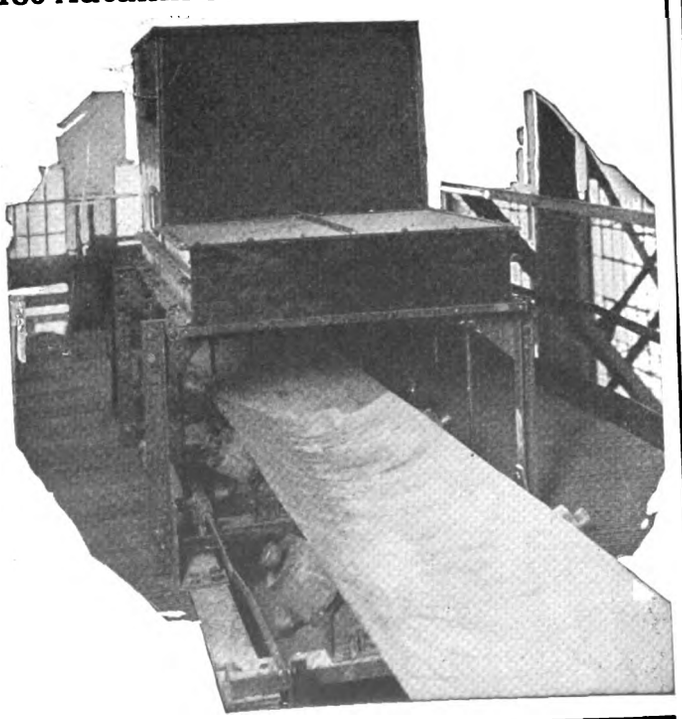
MERRICK Weightometers

This simple device enables you to accurately weigh all bulk materials as they move on the conveyor without interrupting the movement. By its use you'll know exactly—within one per cent of accuracy—how your material you receive, or ship, or pass from one department to another. There's no chance of error or shortage—and no delay in the movement of the goods.

Send for our well illustrated catalog and see how many firms in many trades are saving money by knowing their weights.

Merrick Scale Mfg. Co.

180 Autumn St. **Passaic, N. J.**



The Publisher's Column

Good Medicine for Hot Weather

Business during normal years lets down a bit during the hot weather and this year is no exception to the general rule.

All indications point emphatically to a big pick-up in volume of business this fall which will put the total for 1925 considerably ahead of 1924—and 1924, surprising as it may seem, was a bigger year for business and industry than the so-called boom year of 1920.

We need to get our plants in first-class shape for the big business that is to come. The next few months offer splendid possibilities for this purpose.

One of the best summer tonics for industrial managers to apply to their plants is the eternal question mark. Each department head should be asked to submit an answer to the following question: "What suggestions have you for increasing the efficiency of your department and its processes during the coming season?"

Not only will such a request bring out valuable and usable information, but it will put each department head on his mettle and perhaps get him out of a possible rut. We encourage children to ask plenty of questions so that they may learn, and it is well for us grown-ups to remember we can learn something ourselves through the same procedure.

Industry Illustrated

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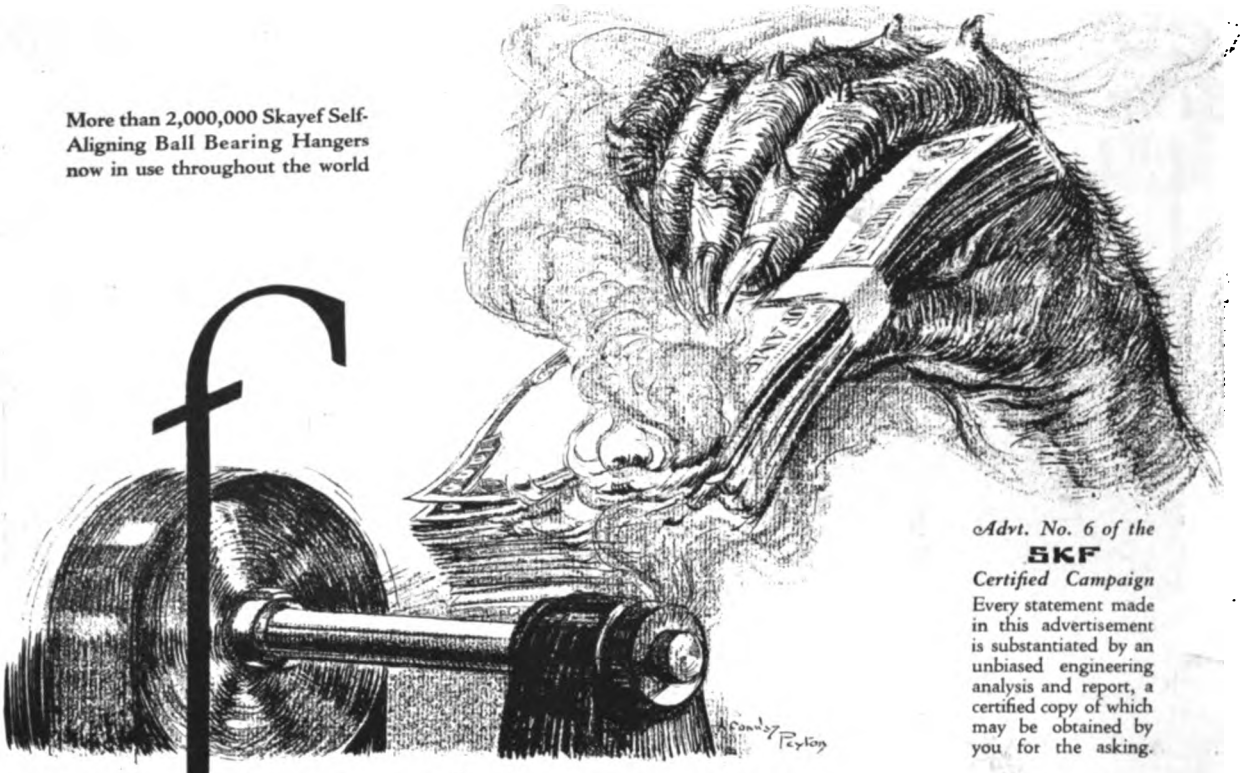
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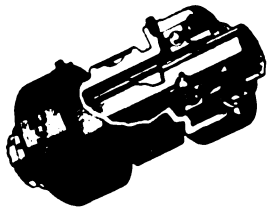
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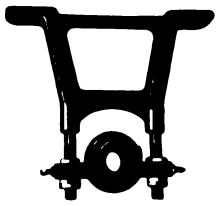


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A Pennsylvania silk mill found this out five years ago when plain bearings were replaced by SKAYEF Self-Aligning Ball Bearing Hangers—330 of them.

The result: A saving of $343.18 a year in maintenance costs and a saving of $1200, or 16%, in power costs! And, instead of plain bearings that dripped oil like an old faucet drips water, were 330 *oil-tight* bearings under which the most precious silks could be stored with safety.

It is these qualities and tangible savings which have led to the adoption of Skayef Hangers in many diversified industries.

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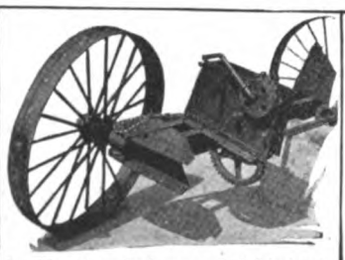
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1.—The Barber-Greene wheels can be swiveled into practically any position, to take care of varying needs. We have them here set at a slight angle.



2.—Here they are set straight with the conveyor frame. The Conveyor is now ready to be moved in any direction, quickly and with but a minimum of effort.



3.—Now the wheels are swiveled to pivot, with the charging hopper as a center. That's a mighty handy trick if you're unloading from beneath a hopper-bottomed car, or track hopper, to a stock pile

Send this coupon to Barber-Greene Company, 500 West Park Avenue, Aurora, Illinois, for "Mr. Barber's Scrapbook" and dope on Portable Conveyors ☐.

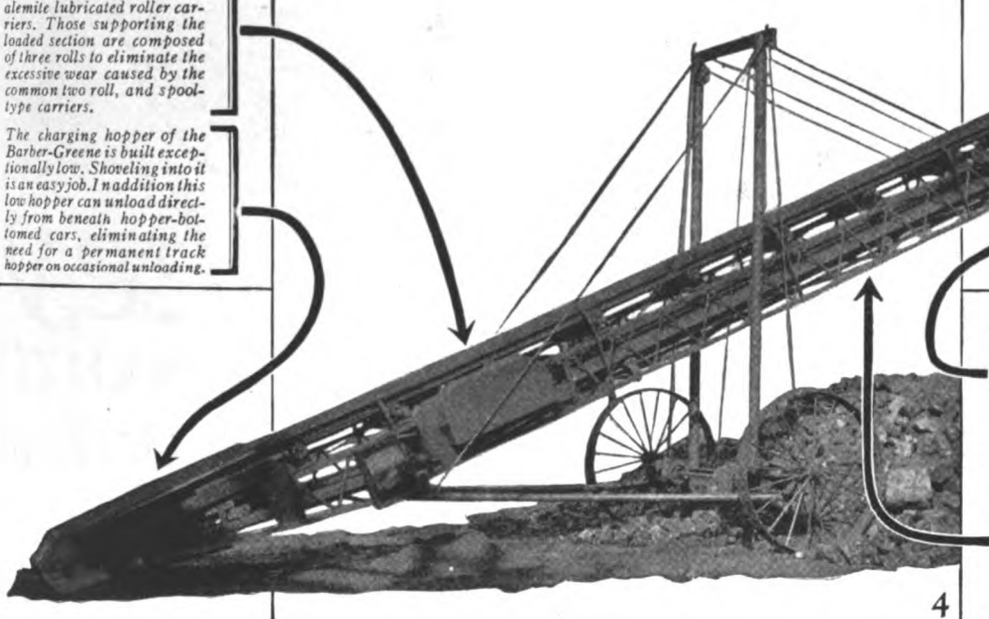
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Both the loaded and empty belt sections are carried on alemite lubricated roller carriers. Those supporting the loaded section are composed of three rolls to eliminate the excessive wear caused by the common two roll, and spool-type carriers.

The charging hopper of the Barber-Greene is built exceptionally low. Shoveling into it is an easy job. In addition this low hopper can unload directly from beneath hopper-bottomed cars, eliminating the need for a permanent track hopper on occasional unloading.



4

The Barber-Greene head end drive pulls the loaded section of the belt—not the idle returning section. Shaft drives to the head end permit the locating of the motor at the hopper end and the engine on the truck.

The Barber-Greene Warren truss, sectional frame. The Warren truss provides exceptional strength together with the light weight that makes for handling ease. The sectional frame can be rebuilt to various lengths from fifteen feet to sixty.

The Portable Conveyor that Drives Handling Costs Down Down Down

There's a lot behind the ability of the Barber-Greene Ideal, Portable type N Conveyor that helps it to drive handling costs down, down, down. Exceptional handiness and ease of operation have a lot to do with it.

For instance, the charging hopper is exceptionally low. And here's how that feature saves a lot of hand labor and cost. It can be pushed beneath, and used to unload hopper-bottomed cars, eliminating the need for a track hopper or shovel labor.

And if hand labor is used, shoveling is fast and comparatively easy into such a low charger.

The other end of the Barber-Greene, type N, has a definite bearing on the driving down of costs. It can be raised or lowered quickly by means of a crank and a brake. This means that it is an easy job to fill a bin and then swing to loading a truck or wagon.

On both those jobs and on stockpiling, it eliminates the need of shovel trimmers or pile builders.

The Ideal type N conveyor can be readily moved. It is mounted on a truck fitted with two independently swinging wheels. They can be set in any position desired.

For example, they can be turned so that the discharge end of the conveyor swings in an arc with the charging hopper as a pivot. That's a mighty handy trick when you're building up a stock pile.

There are a lot of other things about the Barber-Greene Ideal, type N Conveyor—the alemite lubricated belt rollers, the head end pulling drive with the tail end drive's advantages, the husky, light weight Warren truss frame, and a lot more that make for fast handling and long life.

They are all shown in our E Catalog. In addition it will be worth your while to ask for "Mr. Barber's Scrapbook." It shows a lot of actual job layouts on which Barber-Greene equipment made good.

The coupon in the upper right hand corner will bring both. Why not use it.

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"The McCaskey System saves us over $1,000 yearly in wages alone, and besides keeping our investment in materials and supplies at a minimum, it enables us to always have sufficient stock on hand."

Thousands of concerns tell the same story of McCaskey efficiency. Write today for your copy of our FREE BOOKLET—"Getting the Drop on Competition." It will give you an insight of the McCaskey System as applied to your business. There's no obligation attached to your request.

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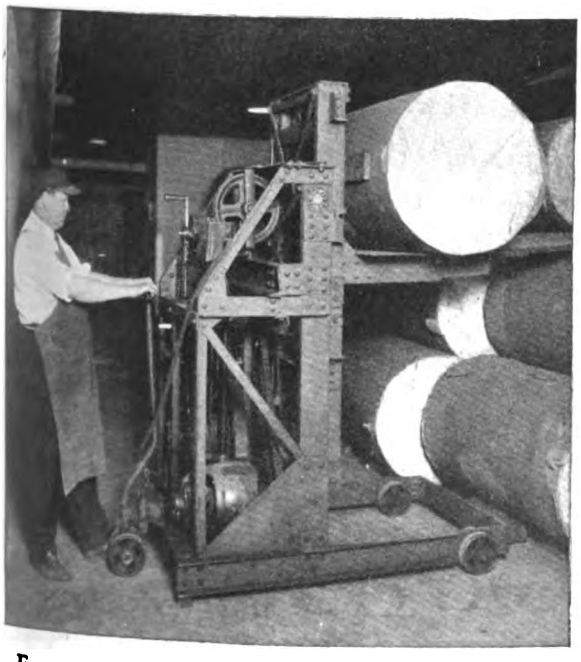
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5 of these portable elevators, built by the Economy Engineering Company, Chicago, Ill., insure rapid handling at the Chicago plant of the Continental Can Company. Equipped with Hyatt roller bearings in the wheels and platform rollers.



Economy Engineering Company, 1500 lb. capacity Hyatt equipped portable elevator handling rolls of paper at the plant of Popular Mechanics Magazine.

Easy Lifting— Rapid Handling

IN the wheels and platform rollers of portable elevators, the right bearings promote smooth operation and speed up the work.

The Economy Engineering Company found that Hyatt roller bearings were the right bearings for these positions—their standard elevators are Hyatt equipped.

This means that the points of hardest service are fortified against rubbing friction and consequent wear. Sturdy steel rollers carry the loads easily and rapidly.

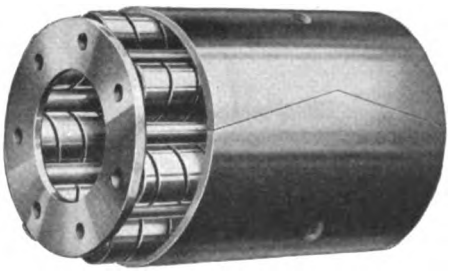
Hyatt bearings require no attention other than oiling three or four times a year—no adjustments, repairs or replacements.

In portable elevators, lift trucks, trailer trucks, hand trucks and other material handling equipment these modern bearings have stood the test imposed by years of hard service. You can be sure of dependable and economical performance by specifying "Hyatt bearings" when equipping *your* plant.

HYATT ROLLER BEARING COMPANY

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HYATT ROLLER BEARINGS FOR INDUSTRIAL AND FREIGHT TRUCKS

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for your electrical equipment



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Then to the right,
Turn the handle—
and U-RE-LITE!

Safeguarding electric motors, power and lighting circuits, against overloads and "shorts" is of such prime importance that only the best protection is good enough. Inadequate protection may mean the destruction of costly equipment or a fire.

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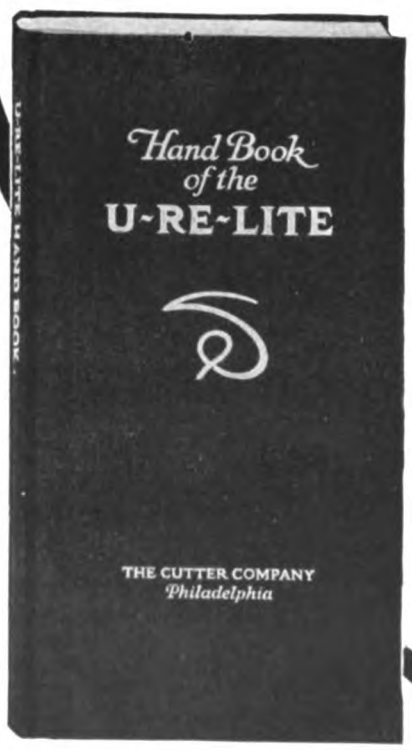
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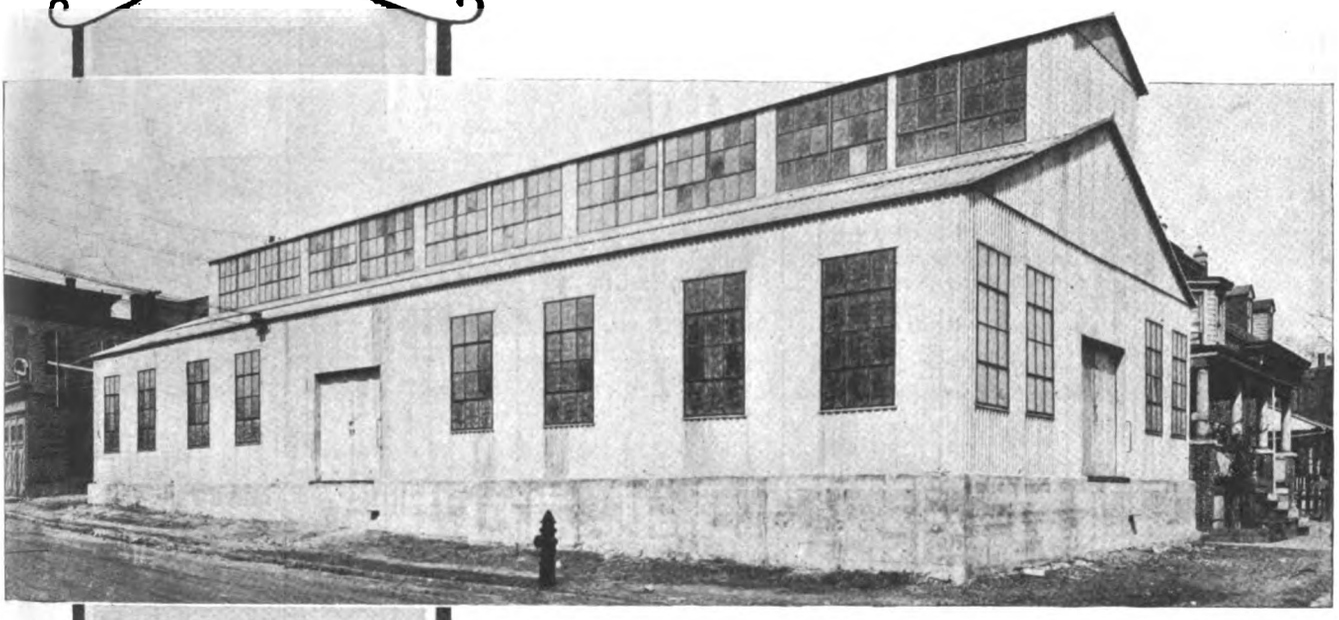
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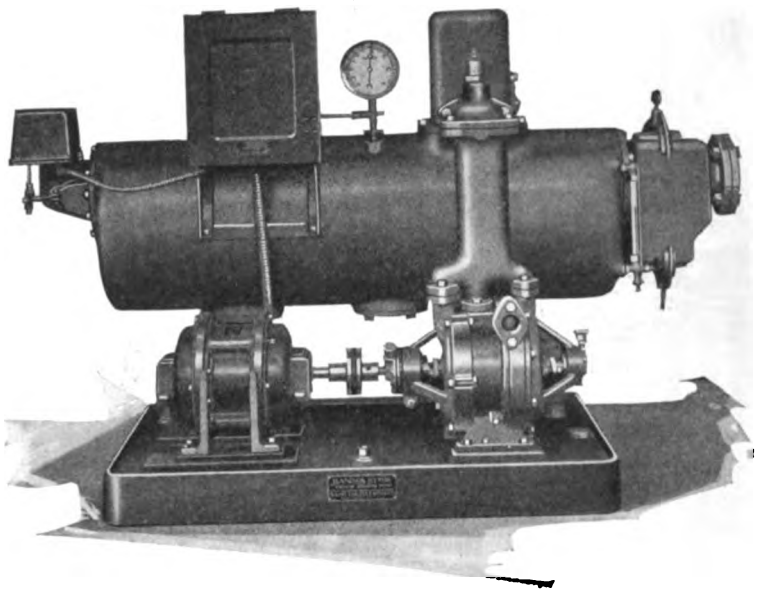
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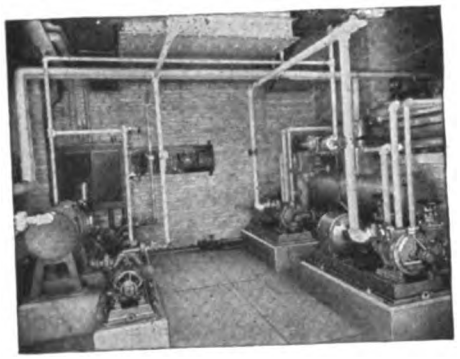
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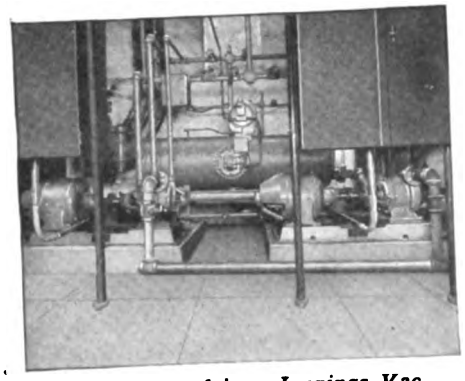
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JULY — 1925

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

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Next Month

ASK any foreman or superintendent today where you can get common labor at 15 cents an hour, and he will laugh at you. Yet, it *can* be done, and *is* being done today in progressive plants.

These plants learned long ago that the day of cheap common labor was gone for good. And what they have done about it—how they found that even fifteen-cents-an-hour human labor would be expensive in comparison with mechanical handling methods—these are the things to which we are devoting some forty-odd pages in our August issue.

Not abstract theorizing, not what the unique and immense plant has done, but a detailed and practical exposition of what is being done to solve the materials handling problem in a half dozen progressive plants of different kinds. That is what we have in store for you next month.

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Dollar-Saving Methods and Factory Overhead

By Norman L. Sammis

AN ideal location, well-designed and constructed buildings, modern equipment and an organization of trained executives and skilled operators are all important factors for a successful industrial business. But before production can proceed, in our present meaning of the term, certain utilities must be available. These utilities are power, heat, light, water and frequently compressed air.

The cost of acquiring these utility commodities by purchase or production, and their distribution, is a large item of overhead expense of a manufacturing business. The amount of this expense is often much greater than need be because of lack of effort and brains devoted to its reduction and control.

Nearly every factory operates steam boiler for heating the buildings or to furnish steam for process work. The power and light is purchased from a central station or produced in the plant by steam-electric or by oil-electric prime movers. The cost reduction investigator should decide which is the cheapest source of power and light, the central station or a factory power plant. The correct decision must be based on a thorough study of central station rates and contracts, factory load conditions, fuels, use of live and exhaust steam, installation and operating costs, estimated future requirements and many additional factors affecting this important question.

With the question settled as to source of power and light, the next move is to study the present equipment and methods with the object of producing power, heat and light at a lower cost. The problem in the boiler plant is to select the correct fuel and to transfer the greatest possible proportion of its heat units into the steam and at the minimum cost for fuel, labor, equipment and maintenance.

The selection of proper power equipment must be based on a complete knowledge of the present needs of the plant for light, heat and power and with suitable allowance for future requirements. The heating needs are included because the amount of exhaust steam which is required has an effect on the selection of the prime mover. In some plants the economy to be gained from installing different power-generation equip-

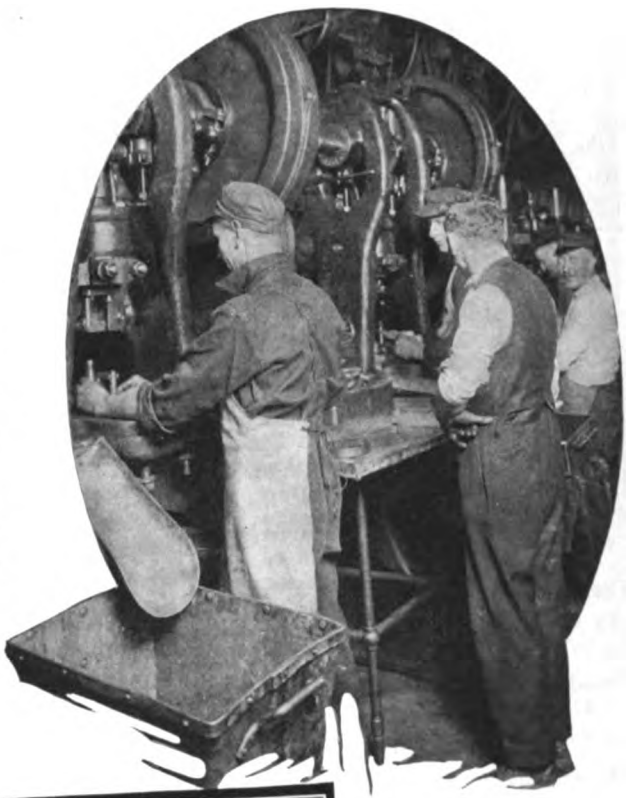


Fig. 1. Operators of production machinery may be found to be wasting power. For instance, machines may be allowed to run idle for long intervals while work is being placed or examined.



Fig. 2. The essentials for efficient transmission of power by line shafting are: correct design, alignment, bearings of minimum friction, and adequate lubrication. Without these, power is constantly wasted.



Fig. 3. Poor distribution of natural daylight is usually due, not to lack of windows, but to neglect of cleaning and failure to utilize the reflecting power of paint.



Fig. 4. A small waste of compressed air by a tool in frequent use soon amounts to more than the cost of a new tool.

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ment is sufficient to justify an immediate change.

The essentials for efficient power transmission by line shafting are correct design, alignment, bearings with minimum friction and adequate lubrication. In many plants, especially the older ones and those which have extended their shafting from time to time, there may be found a serious waste of power which can be reduced or eliminated by changes in layout, better alignment or other measures to remove friction.

Any avoidable friction in this power transmission mechanism is constantly absorbing power without useful result. Slipping and excessively tight belts, misalignment of shafts and pulleys, poor bearings, lack of proper lubrication, etc., are all power-waste conditions which must be found and corrected and then kept corrected.

Poor distribution of natural daylight is usually not due to a lack of windows and skylights, although this may be the condition in old buildings or those converted to productive use, but rather to lack of maintenance and thought. Clean glass, clean white or light-colored interior walls and ceilings, provision for daylight control by curtains, prismatic glass or other means and regular testing of light conditions by means of a foot-candle meter are the requisites of satisfactory day lighting.

The first essential of economical artificial lighting is a layout of light units which is rightly planned. The amount, location and type of lighting required for each area is a separate problem and depends on the kind of work being done and the local conditions in the area to which it is to be applied. Proper layout or plan of artificial lighting systems will aid production and gain economy in the consumption of electricity.

The second essential is adequate maintenance of lighting equipment. The lamps and reflectors must be clean to produce maximum illumination and broken or defective units should be replaced promptly. The foot-candle meter will prove of great assistance in checking illumination and in maintaining it to standards determined as correct.

With a factory heating system of suitable design and capable of adequately heating the buildings, it is necessary to maintain it in good condition if it is to operate satisfactorily. The entire system should receive periodic inspections, say once in two weeks, during the heating season. Pipe insulation repairs and replacements, leaks, broken or loose hangers, defective traps, air valves, etc., and cleaning of the radiating surfaces are some items of maintenance. Tests have indicated that the coating of radiators with the usual bronzing liquid reduces the heating capacity more than if a good grade

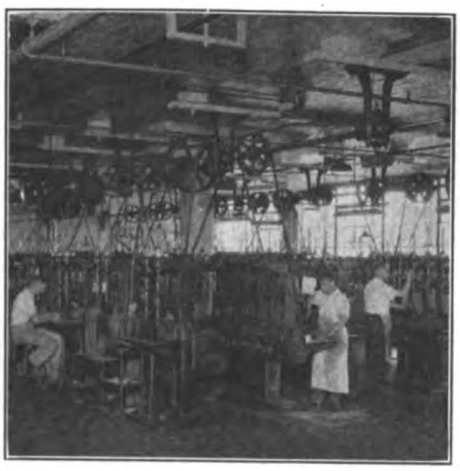
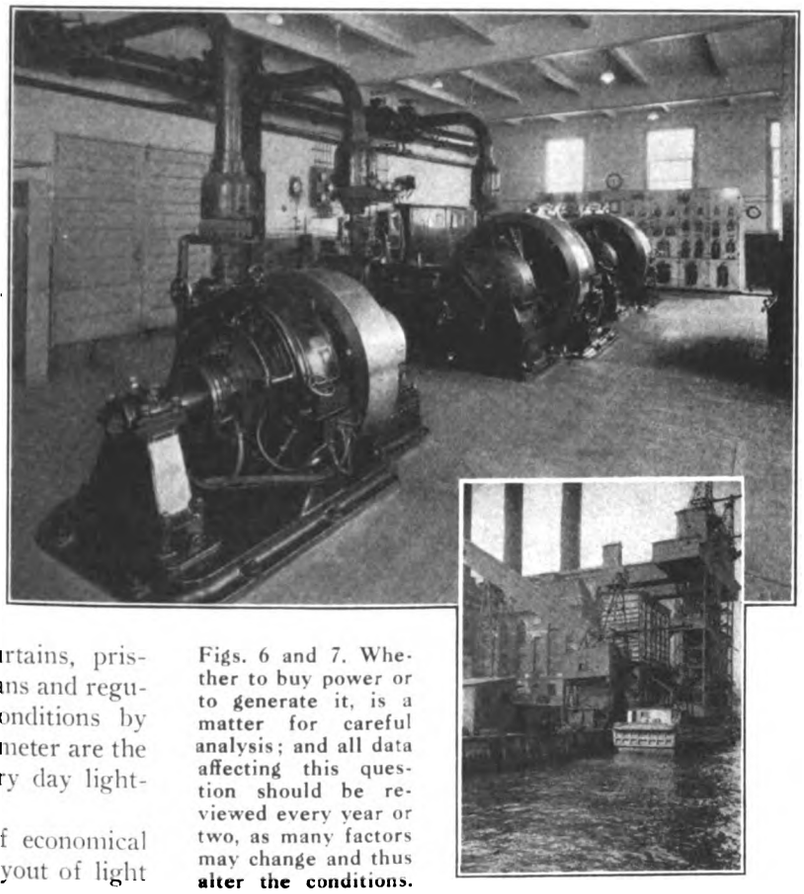


Fig. 5. The design of belt drives should receive special investigation. Slipping, or excessively tight belts, poor bearings, badly joined belts, all are sources of expensive power waste.



Figs. 6 and 7. Whether to buy power or to generate it, is a matter for careful analysis; and all data affecting this question should be reviewed every year or two, as many factors may change and thus alter the conditions.

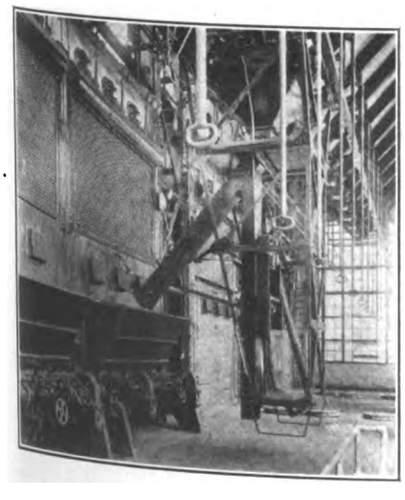


Fig. 8. The boiler room offers more opportunities for both small and large economies than the engine room. Gauges and testing instruments are essential, and large investments here pay big dividends.

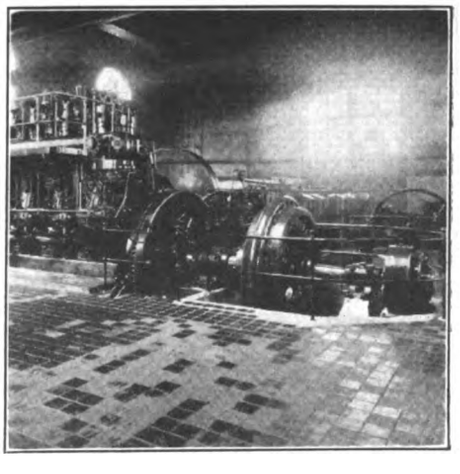
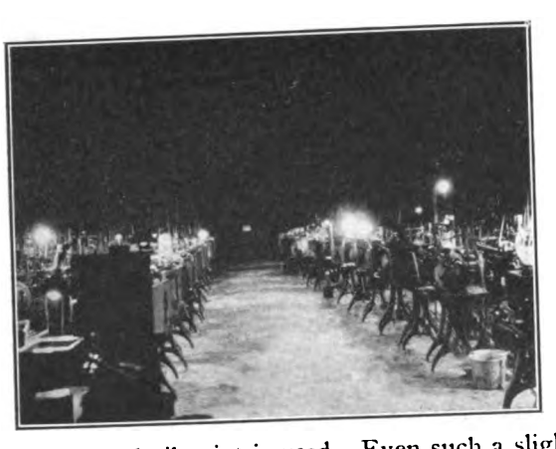


Fig. 9. The oil-electric power plant is economical and has certain advantages where the demand for process or heating steam is light.

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Figs. 10 and 11. The first essential of economical artificial lighting is a layout of units which is rightly planned. It saves eyes, spoilage, and lighting bills.

of lead and oil paint is used. Even such a slight change as the replacement of air valves may produce much benefit.

Often worth while economies in the consumption of steam for process heating can be secured by investigation and study of the local conditions and methods of application. In many cases another source of heat such as gas, electricity or oil might be found to be more economical and give better results, particularly for occasional use or where the amount of heat required is slight.

A thorough survey of the consumption of water in a manufacturing plant will reveal many opportunities for economy of this utility. When it is realized that an opening ⅛ of an inch in diameter in pipe or fitting containing water at 40 pounds pressure will allow $144 worth of water to pass through in a year's time, assuming 1,000 gallons to cost fifteen and one-half cents, the money value of water conservation is made apparent. An opening of ¼" will pass pass $576 worth and an opening of ½" $2,304 worth in one year under the same conditions.



Fig. 12. Where central control is not established, frequently windows are opened, instead of cutting down the heat supply; resulting in throwing away heat and putting an unnecessary load on the supply line.

An air compressor usually operates constantly during working hours and is a large consumer of power. If the type in use is clearly much less economical than another type would be under the conditions present, it is probable a change should be made.

For the average cost of compressing 1,000 cubic feet of free air to a pressure of 100 pounds per square inch, we will take the figure of 10 cents. An opening ⅛" in diameter will leak $560 worth of compressed air in a year assuming the pressure is on 10 hours per day. Even the tiny opening of 1/32" will leak $35 worth under like conditions. It should be remembered that even the smallest leak is worth considerable trouble to find and eliminate.

The mechanical condition and maintenance of all pneumatic tools and machines should be regularly inspected and inefficient equipment either put in good working order or discarded. A small waste of compressed air by a tool in frequent use will soon amount to more than the cost of a new tool or the necessary repairs. Such inspection should also include the chipping chisels, drills, etc., used in the tools to make certain they are sharp.

The practice of economy in the use of compressed air should be firmly and persistently impressed on those who operate pneumatic tools and machines. It will pay good dividends of savings to thoroughly sell such men the idea of efficient use of the valuable commodity they employ. For, after all, in their hands lies the greatest opportunity for economy.

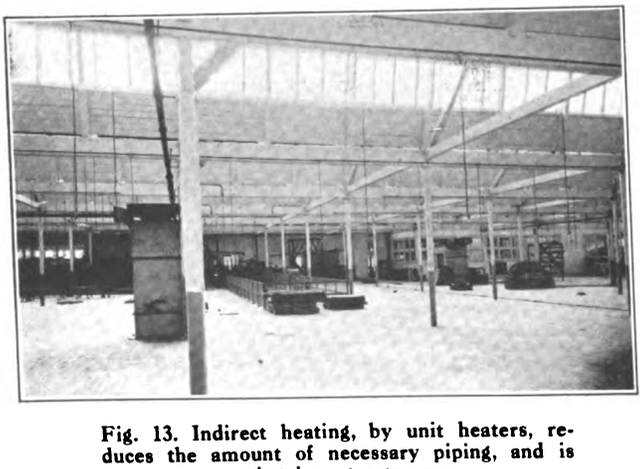


Fig. 13. Indirect heating, by unit heaters, reduces the amount of necessary piping, and is coming into greater use.



Fig. 14. With water costing 15½ cents per 1,000 gals., and under a 40 lb. pressure, a ¼" leak will waste $576 worth in a year. Leaky fittings are expensive.

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He Built Our First Helium Plant

A Bit of the Life Story of W. F. Barrett

By Herbert Johnson

WE hear a great deal nowadays about the great aeronautical achievement represented by our two monster dirigibles, both of them marvels of inventive ingenuity and engineering skill. I wonder how many of us know that perhaps the biggest share of the credit for making dirigibles safe lies with an American engineer, Dr. W. F. Barrett? It was he who designed and constructed and managed the operation of the first and only successful plant producing helium, the non-combustible gas for dirigibles and balloons which does away with the extremely hazardous use of explosive hydrogen.



Dr. W. F. Barrett, who designed, constructed and managed the operation of the first successful plant for producing helium.

Flying is not a particularly safe occupation. In fact, most insurance companies put clauses in their policies which make them inoperative in case of death or accident where one leaves terra firma and soars among the clouds. But if ordinary flying in heavier-than-air machines is considered risky, what can one say about the risk of going aloft accompanied by several million cubic feet of hydrogen gas as explosive as dynamite and only waiting for the least spark to release its damaging energy. Up to the time that America built the first helium plant, hydrogen gas was the accepted, in fact the only, buoyant gas used in the inflation of balloons and dirigibles.

Doctor Barrett received the honorary degree of Doctor of Science at the University of Pittsburgh at the recent Charter Day Exercises, in recognition of his achievements in the production and commercialism of industrial gases.

Doctor Barrett is a graduate of the Sheffield Scientific School of Yale University. After graduating from there he entered the employ of the Peoples Gas Light and Coke Company of Chicago, remaining with this company for ten years, and finally becoming assistant superintendent and chief engineer.

In 1913, he became associated with the Linde Air Products Company in the capacity of works manager and chief engineer. He recognized the possibilities of the oxy-acetylene process and has been an important factor in directing its remarkable development.

The Linde Air Products Company was called upon during the war to take part in the great program of supplying essential commodities. Doctor Barrett was active in the direction of this work and served on special Government committees on gases. It was for the Government that he built our helium plant. Doctor Barrett is vice-president of both the Union Carbide and Carbon Research Laboratories, and the Carbide and Carbon Chemical Corporation, as well as vice-president of the Linde Air Products Company, which is a subsidiary of the Union Carbide and Carbon Corporation. He is also president of the Dominion Oxygen Company, Ltd., vice-president and director of the Prest-O-Lite Company, Inc., and a director of the National Carbon Company, Inc. His career is a striking example of the advantages of making the most of the opportunities in the job at hand and should be an inspiration to those who are beginning their industrial careers.

The chemists and physicists of today, in contrast to those of the Middle Ages, devote their energies to practical, useful research. And, having made their laboratory discoveries they leave it to other men, men of ingenuity and grasp—men of engineering training—to put these discoveries to use. Such a man is Doctor Barrett.

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The Where and When of Grease Lubrication

By Allen F. Brewer

IN the selection of lubricants for industrial machinery a most essential factor is adequate knowledge of the operating conditions and constructional features that must be met. In fact, the question of whether to use grease or oil will hinge directly upon these conditions. Our concern in this article is essentially "where and when" to use grease, for grease as a lubricant is one of the most important items in the up-keep and maintenance of industrial and power plant machinery. Like oil, however, it is more or less subsidiary to the means provided for lubrication. In other words, a force feed oiling system would not be applicable to grease lubrication; likewise, a compression grease cup would be totally inadequate for handling a light machine oil.

The days of the squirt can and grease "paddle" are practically past. In the modern industrial plant sloppy lubrication has given way to common sense, not only in the matter of selection of the products, but in the use of lubricating equipment which has been scientically designed to best effect the economical delivery of these lubricants to the wearing parts involved. In other words, the machine designer, the lubricating specialist and the operating engineer have collaborated, so to speak, to render the practice of lubrication a veritable science. The roughest kind of a comparative test, based on power consumption required under the old versus the new or modern way of lubricating, will furnish convincing evidence as to the success of their efforts.

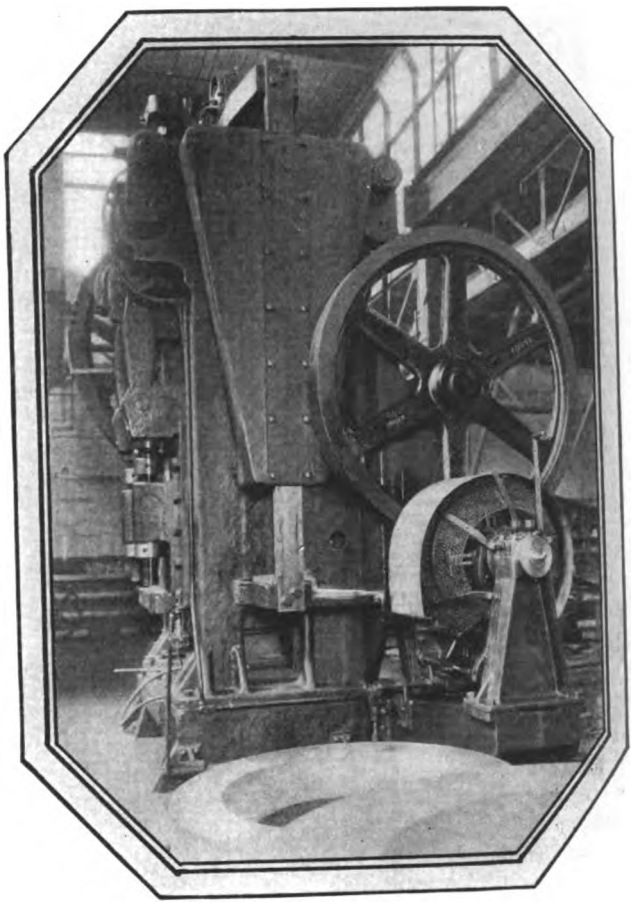


Fig. 1. The pin type of grease cup installed on the bearings of a 500 ton press. Intensive pressures have proven grease lubrication to be advantageous on such machinery.

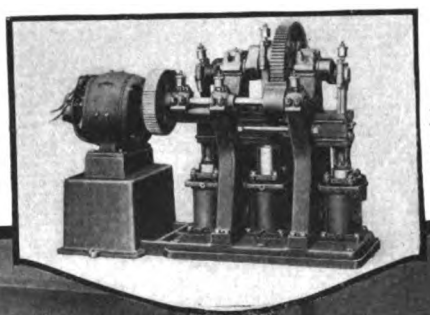


Fig. 2. A triplex pump equipped for grease lubrication on all main bearings. Pressures will often be intensive on such pumps when heavy, viscous fluids are being pumped.

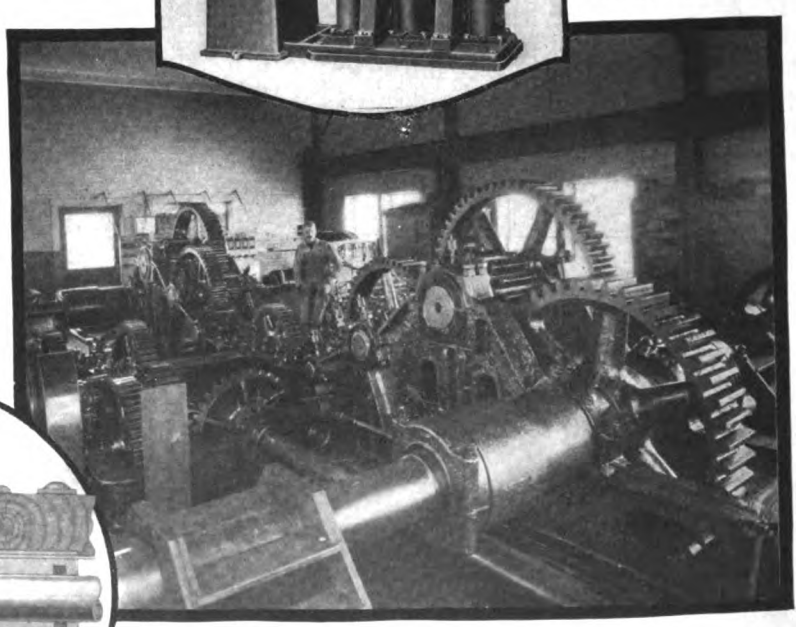


Fig. 3. When an extensive gear installation is involved, the usual conditions will require grease lubrication of the gear shaft bearings.

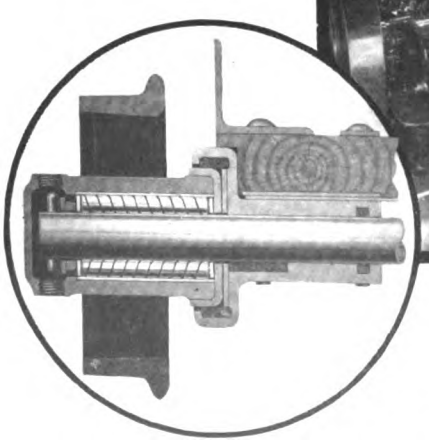


Fig. 4. Details of a modern roller bearing. Such equipment will often function most satisfactorily with grease lubrication.

As oils have been studied, so have greases. These latter have involved more difficulties, for their manner of preparation may be attended with many provisions, and it is a comparatively easy matter to ruin a batch of grease for lubricating purposes by inattention to temperatures, time elements, or the manner of adding the various constituents. All this will be discussed in a later article to deal with the various types of greases and their methods of preparation. For

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the present the operating and production conditions, which authorities have agreed will warrant the use of grease as the most suitable lubricant, demand attention. They are in effect the guide posts in the selection of grease rather than oil for the purpose of lubrication. Briefly summarized, they are:

1. Wherever the wearing parts such as bearings are located in dangerous or inaccessible positions, where regular oiling or the filling of oil cups or wells would be a difficult matter, or where the installation of an extensive pressure oiling system would be an unwarranted expense. Here grease lubrication is the ideal solution, using either a compression or pin type cup, or perhaps carrying a few pipes out to a point where some form of pressure greasing device can be attached. The pin type of cup is perhaps the most automatic and economical attachment and has been found to give very satisfactory results on all manner of inaccessible overhead equipment, for example. A decided point in favor of grease lubrication is, of course, that devices as above can be readily installed on plain babbitted bearings with little or no alteration of construction.

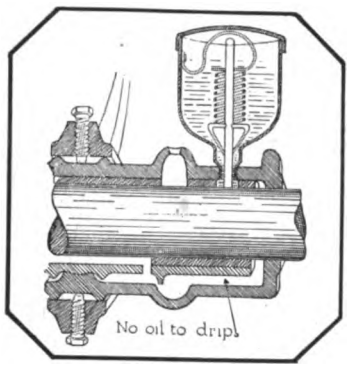


Fig. 5. Showing the constructional features and method of installation of a typical pin type grease cup. Such a device is practically automatic, functioning only when the shaft is in motion.

2. Grease is also suited to low speed conditions and high pressures. In other words, it "stays put" and effectively resists pressures provided it has been properly compounded.

3. Where bearing construction is such that oil would not be retained in the clearance spaces, due to high bearing pressures, squeezing out, slow rubbing speeds, high operating temperatures, or open ends. Any one of these conditions would amply justify the application of a grade of grease of suitable consistency and melting point (temperature) to insure the maintenance of a more permanent lubricating film. High operating temperatures are always a potential detriment to effective oil lubrication, due to the extent to which the viscosity may be reduced and the film thinned out, and the possibility of vaporization which might ultimately cause gumming or the clogging of the oil ducts with heavy residual matter, especially if dust and dirt are present and have access to the bearings or lubricator.

4. Grease is also advantageous as a lubricant wherever the equipment or wearing parts may be subjected to repeated shocks. It is the opinion of many authorities that, depending on the intensity, shock or vibration will have a tendency to break the lubricating film in a bearing, and if this cannot be instantly renewed, there will, of course, be a possibility of lack of lubrication occurring. As a result, the film should be of a sufficient body or viscosity to resist being harmed or broken in any way whatsoever. Of course, a heavy oil will in many cases serve the purpose, but on the type of machinery where this is apt to happen it will in general be more economical to use grease. The tractor, auto truck and motor car are excellent examples of cases where this might be liable to occur.

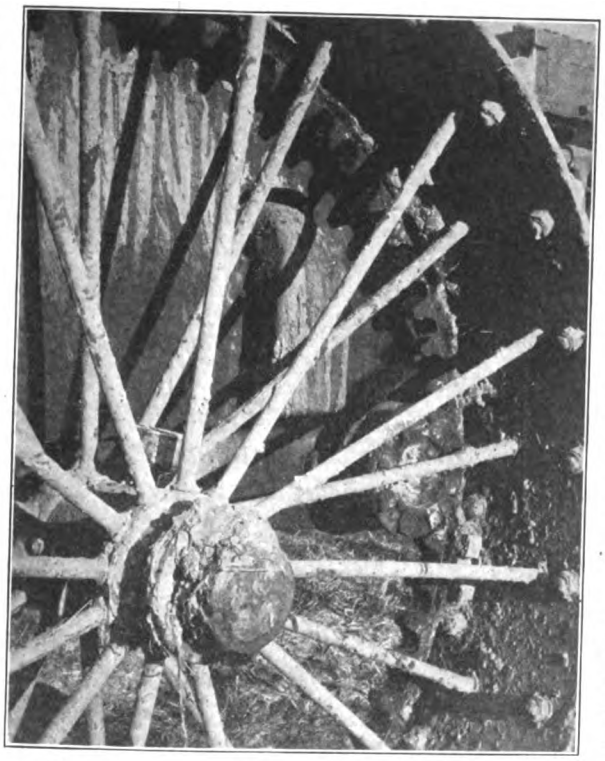


Fig. 6. The conditions which a compression grease cup will often have to correct. Here is one lubricating the axle or wheel bearing of a farm machine. Mud, dust, dirt, etc., are practically always present to defeat the attainment of proper lubrication.

5. It is also advantageous to use grease on machinery where it is essential to prevent the lubricant from being splashed or dripped on to the product, to cause "oil spots." A typical example of such a condition is the textile mill loom, where fabrics must be protected in every way possible, or in the baking and flour milling industry. For this reason we will find grease regarded in very high favor by a great many authorities who have to deal with the operation of such machinery. As a general rule, if a grease of proper characteristics has been

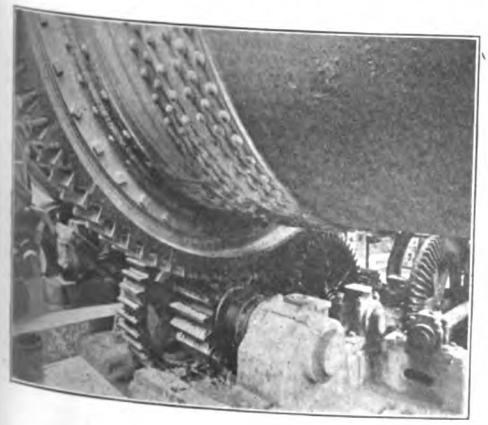


Fig. 7. The gears of a cement mill kiln, with their respective shaft bearings require very careful lubrication, due to the pressure and temperatures usually involved.

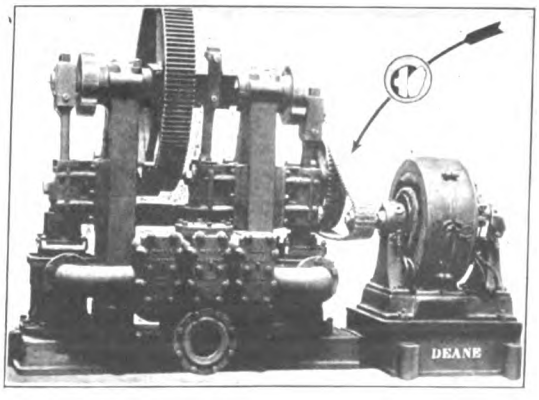
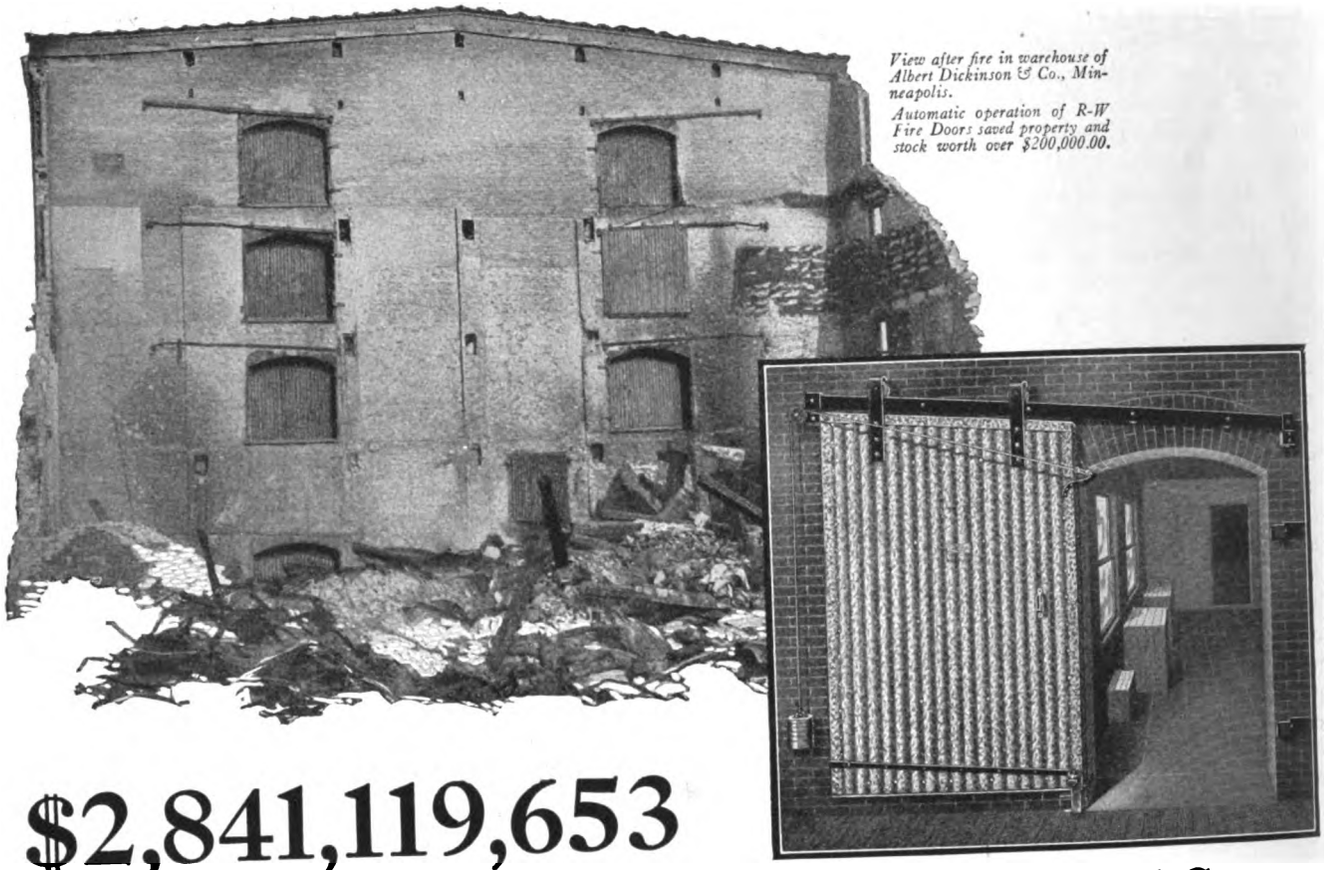


Fig. 8. The silent chain is another piece of equipment which can very frequently be most effectively lubricated with grease.

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View after fire in warehouse of Albert Dickinson & Co., Minneapolis.
Automatic operation of R-W Fire Doors saved property and stock worth over $200,000.00.

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Aggregate of Fire Losses in the United States Since the World War

Figures that stagger the imagination. They would be incredible were they not the official finding of the National Board of Fire Underwriters. More than twice as large as the public debt when the United States entered the war. But—enormous as this total—think how much larger it would have been were not so many great buildings equipped with R-W Automatic Fire Doors and Fire Door Hardware. Let a fire start and the action of the heat automatically closes the doors. The fire is confined to point of origin. R-W Automatic Fire Door Equipment bears the label of the Underwriters Laboratories. And because these R-W Fire Doors serve so effectively in preventing fire losses, buildings equipped with them enjoy substantial reductions in fire-insurance premiums.

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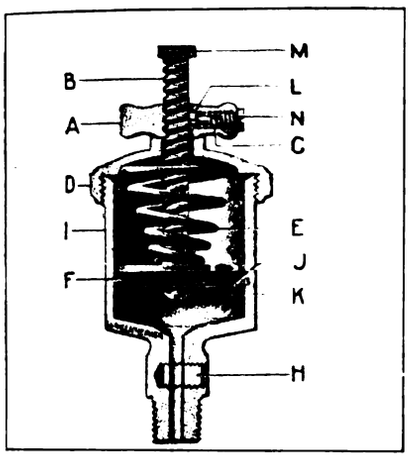


Fig. 9. Details of a typical compression grease cup. "A" is the control handle, "B" the plunger stem, "L," "C," and "N" a spring locking mechanism which prevents alteration of plunger adjustment, "F" is a leather packed plunger under pressure of a steel spring, "E," and "H" is the regulating screw which controls delivery of the lubricant to the bearing.

chosen, it will be capable of but little tendency to leak or drip out from its containers or from the ends of the bearings; provided, of course, that intelligence is used in its application, and the lubricating equipment has been properly designed and installed. Another advantage that textile mill greases will have is that even if they do leak on to the goods, they can oftentimes be practically entirely removed by scouring, etc.

6. Then there are other industries where the lubricant must retain its position with relation to the bearing or wearing surfaces by virtue of its physical characteristics, regardless of whether the parts are idle or in motion. Here the product is oftentimes applied in the form of a cake, being either pressed up against the under side of the journal or laid on the top of the shaft. As a rule, greases for such purposes are solid products, of a comparatively high melting point. Excellent examples of conditions where greases of this type are used will be the driving journals on the modern locomotive or the tunnel bearings which serve to keep the main shaft in alignment on board ship.

7. Finally, grease is advantageous wherever positive lubrication must be brought about over extended lengths of time under conditions as already discussed, with the least amount of attention. There are certain bearings on numerous machines which will be located adjacent to gearing, chains or belting. If they become worn, or if abnormally large clearances are developed, the ultimate results may often be damage to gear teeth, chains, or the cause of inaccuracy of operation, due to their adjacent parts becoming out of line.

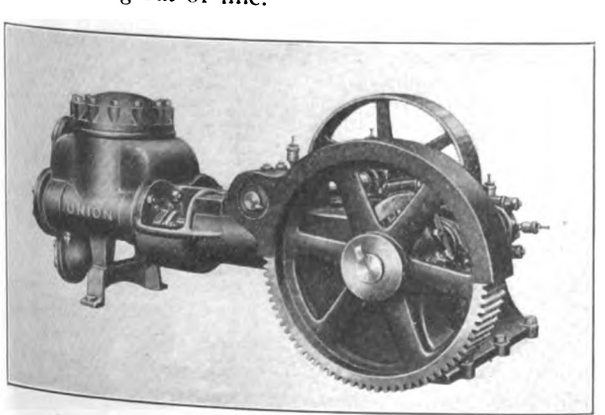
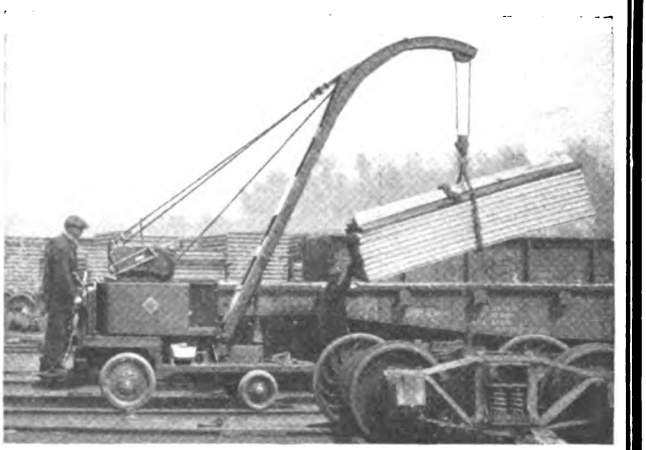


Fig. 10. A horizontal, reciprocating, gear driven pump provided for grease lubrication by means of compression grease cups. Considerable pressure is often encountered in pumping, and the exposed nature of many of the bearings requires the protection of a heavy film of lubricant such as would be afforded by grease.



New Electric Rail Crane

Another Step Forward

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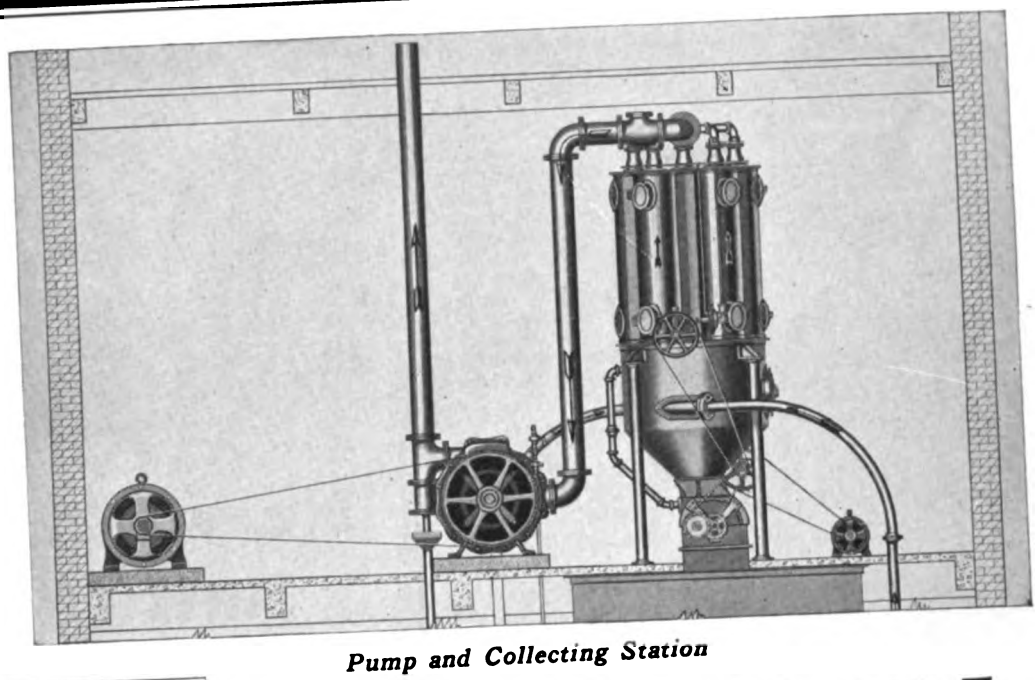
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The ELWELL-PARKER ELECTRIC COMPANY

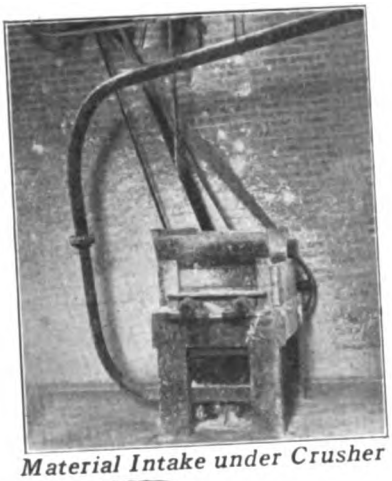
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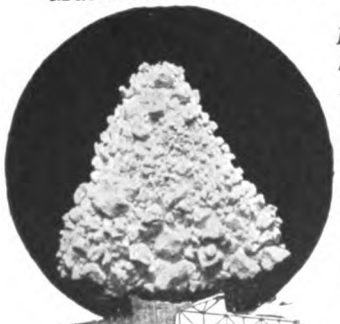
One of the great advantages of DRACCO Pneumatic Conveying is the simplicity of construction and operation. Here two conveying lines are used for transporting lithophone. One conveying line runs a distance of 243 feet, the other 128 feet. Both lines run from two separate points, from crushers to the same collecting stations.

DRACCO PNEUMATIC CONVEYING SYSTEMS

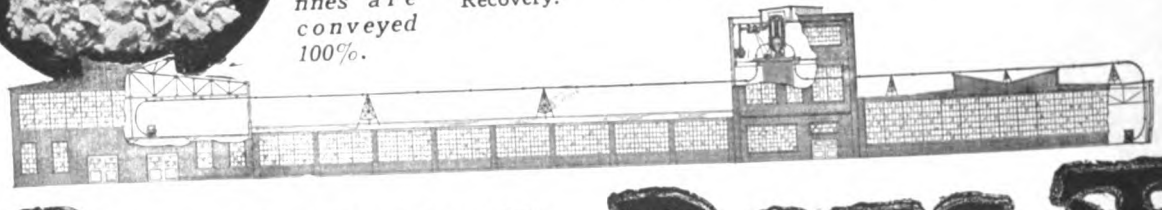
have many such installations, where many difficulties, hitherto unsurmountable, were successfully overcome. For in what other system would it have been possible to lay conveying lines through buildings, over the tops of other structures and through open spaces without the necessity of extra building construction? And consider also the fact that finely powdered or injurious materials can be conveyed without waste, with saving of labor, health and valuable space.

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The Art of the Automatic Fireman

II—*The Characteristics of Different Types of Automatic Stokers*

By Francis Juraschek

THE application of forced draft to chain grate stokers, all of which were originally developed for natural draft operation, encountered many difficulties in the beginning. It is readily seen that the air pressure should not be great in the front section of the furnace, because the fresh coal there must be ignited by the action of the radiant heat from the overhanging ignition arches. Too much air here keeps the fresh coal from igniting properly. In the middle half of the grate, however, the air pressure should be high, as it is here that the combustion processes should proceed at a high rate. But at the rear of the grate, where the fire gets thin, because little save ash is left, the air pressure should decrease again, or else the fine ash will be blown off the fire bed up into the boiler passes, and excess quantities of air following through the practically bare grates will impede the combustion further front.

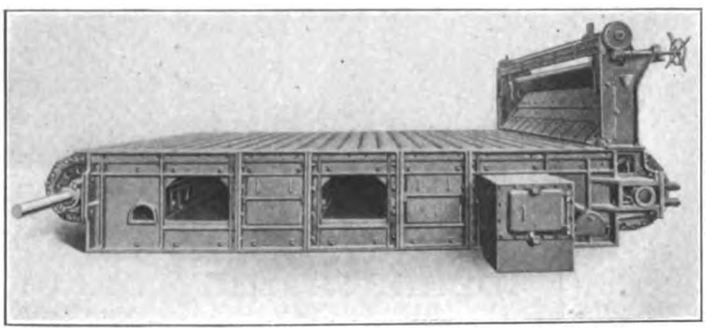


Fig. 1. The Coxe Traveling Grate Stoker was the first to successfully employ forced draft principles of operation, and now they burn efficiently all low grade fuels, whether anthracite or bituminous.

The difficulties were overcome by installing wind boxes running from side to side of the stoker under the grates, with individual control of the air pressure in each. In one stoker, for instance, there is a suction down through the fuel bed instead of air pressure up in the first compartment, to hasten the ignition of the fresh charges of fuel. In the next compartment the air pressure is low, in the next high, and in the last low again, to meet the conditions just set forth.

No entirely satisfactory means have been developed for applying forced draft to overfeed stokers except in a small way. This is due partly to the method of burning the fuel, and partly to the difficulty of maintaining the proper pressures in different parts of the fuel bed.

All underfeed stokers, however, are operated with forced draft, because the underfeed principle tends to pack the fuel in heavy masses through which air must be forced to insure combustion. The fuel is carried thicker on underfeed stoker than on any other type.

The problem of forcing air uniformly through this heavy mass has been solved by making the sides of the retorts through which the fresh coal is pushed, perforated air chambers, called "tuyeres." A glance at the accompanying illustrations of underfeed stokers will show how it is possible with these many hundred small air outlets throughout the entire fuel bed, to secure a perfect distribution of air at any pressure required, to the fire.

A comparatively recent development of the underfeed stoker has been the addition of a set of extension grates at the rear end of the underfeed section; providing in effect a short space where the overfeed principle is brought into play. This is for the purpose of securing the most complete combustion of the fuel possible when the furnace is pushed to very high over-ratings, and when the coal is being pushed into the furnace so fast that it is not possible to burn out the combustible completely in the underfeed section proper.

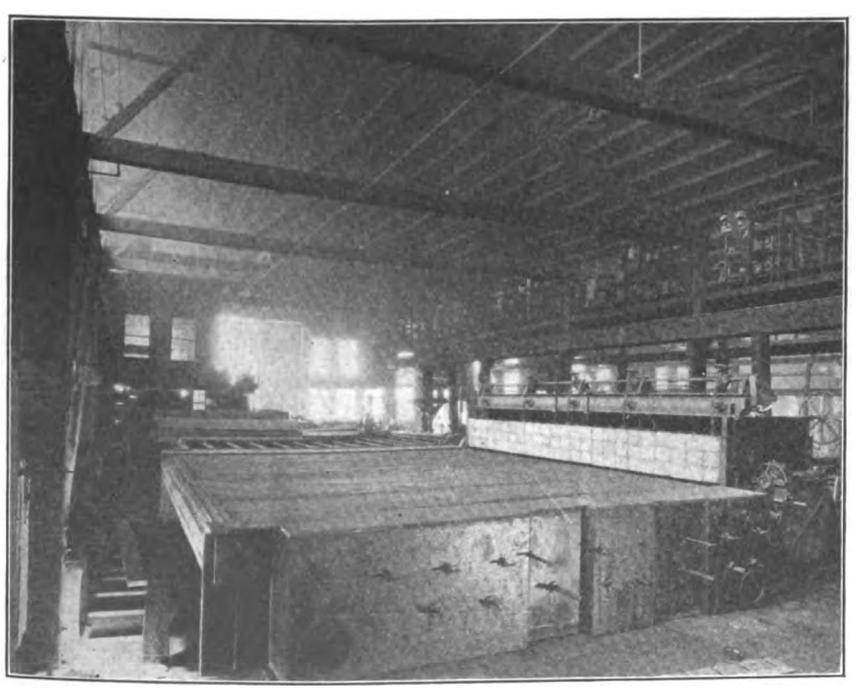


Fig. 2. The special feature of the Illinois Chain Grate Stoker with forced draft is the induction chamber which causes a suction of air *down* through the grate instead of pressure *up* in the first air compartment from the front of the stoker.

Another development of great importance is the substitution of clinker rolls set deep below the extension grates instead of ash dump plates. This deep pit helps burn the last bit of combustible out of the ash, and cools the ash before it is delivered to the ash pit. And the clinker rolls effectively break the ash up into small particles, making automatic ash removal simpler.

In this connection, it may be said

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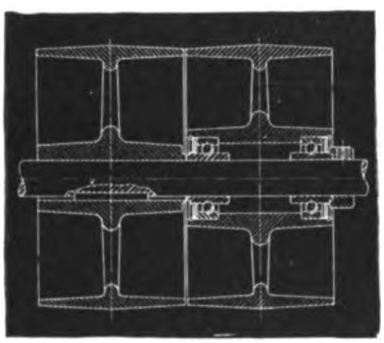


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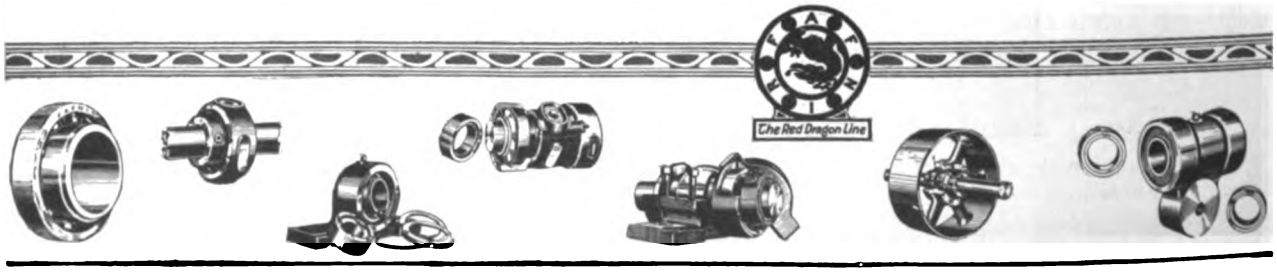
The inner ring is locked to the shaft by a collar, which in turn is secured to the shaft by a large set **screw,—shaft, collar and inner ring all revolving as a unit. The inner ring cannot slip and score the shaft.**



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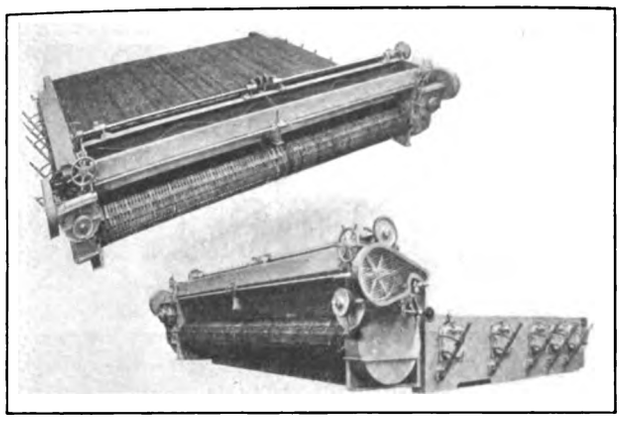


Fig. 3. This Babcock & Wilcox Chain Grate Stoker is also of the standard link type, but is built for forced draft operation. The five levers on the side control five separate wind boxes.

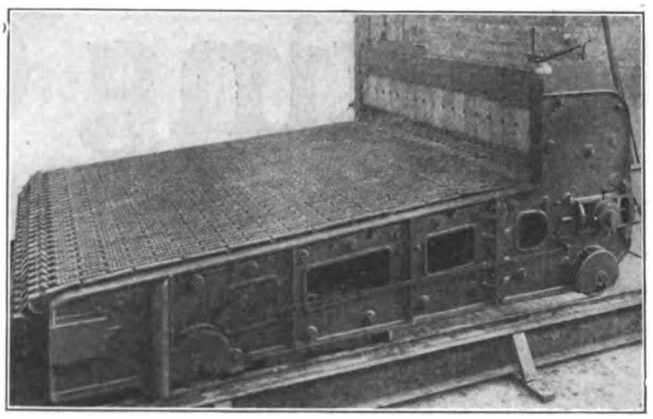


Fig. 4. This close-up view of the Laclede Chain Grate Stoker shows clearly the principle of the construction of the endless belt of grate bars linked together.

that only when automatic coal handling and ash removal apparatus is used in connection with a stoker, are the full benefits of low labor charges in the boiler room realized. As a means of comparison, it may be stated that one man cannot take care of more than 300 to 500 hp. in a hand-fired plant, whereas a stoker-fired plant with mechanical coal handling and automatic ash removal facilities is easily handled by one man up to a limit of about 4,000 hp.

In the words of the author of a booklet which has recently gained a widespread circulation—"Coal, the Basic Fuel":

"Applied combustion engineering owes its present high standard largely to the development of the mechanical stoker. . . . The old-time engineer judged the efficiency of his furnaces by the steam pressure gauge and his practical knowledge of how a fire should look. Sometimes he guessed right; more often he wasted coal.

"The modern combustion engineer calls upon chemistry and instruments for analyzing the products of combustion, to guide him in building furnaces and firing coal. Science guides him. Practical results verify each step. He *knows* that he is right." Which truly states the case.

The application of a stoker to any given condition is not a matter of guess-work. It is not a nostrum designed to effect a universal cure. The ills to which power plants are heir require as keen and intelligent a diagnosis as the human being afflicted with a deep-rooted organic disease. Stokers should be, and in general are, prescribed only after competent combustion engineers have analyzed thoroughly the governing conditions in each case. When this is not done, successful operation is apt to be more a matter of luck than of good judgment.

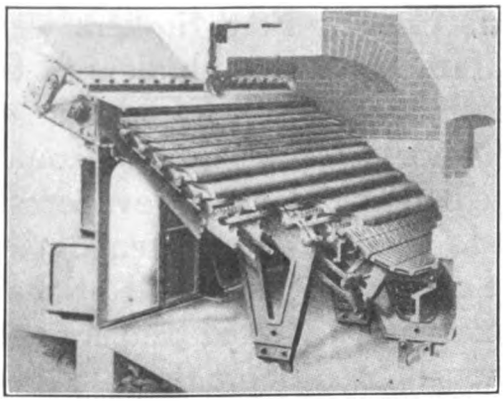


Fig. 5. The Westinghouse-Rooney Stoker is typical of the inclined front feed stokers. The coal is fed from the hopper over the fuel bed by a pusher plate. The grates rock back and forth.

Some of the most important considerations affecting the successful operation of a stoker are the analysis of the coals available, the firing rates necessary for different plant loads, the methods of coal feed, and the means for ash disposal. Add to these general factors the considerations involved in the type of boiler, the design of the furnace setting and other specific facts encountered in each individual case, and it will be seen that it is not a matter for the tyro to settle.

Yet, so great are the benefits sure to be derived from the appli-

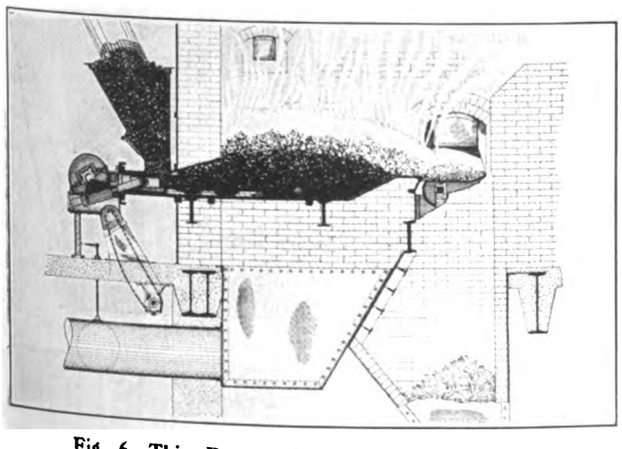


Fig. 6. This Detroit Multiple Retort Stoker illustrates the underfeed principle. The method of combustion in this type of stoker is to coke the coal before it reaches the burning zone, from beneath, then burn it as coke.

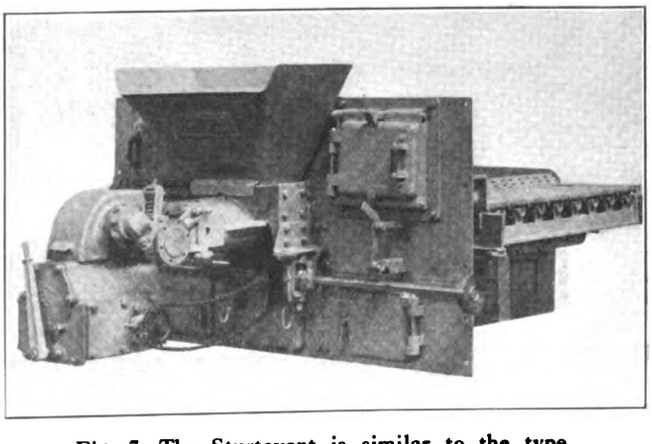


Fig. 7. The Sturtevant is similar to the type "K" in general design, and this view is given to show the appearance of such a stoker from the front.

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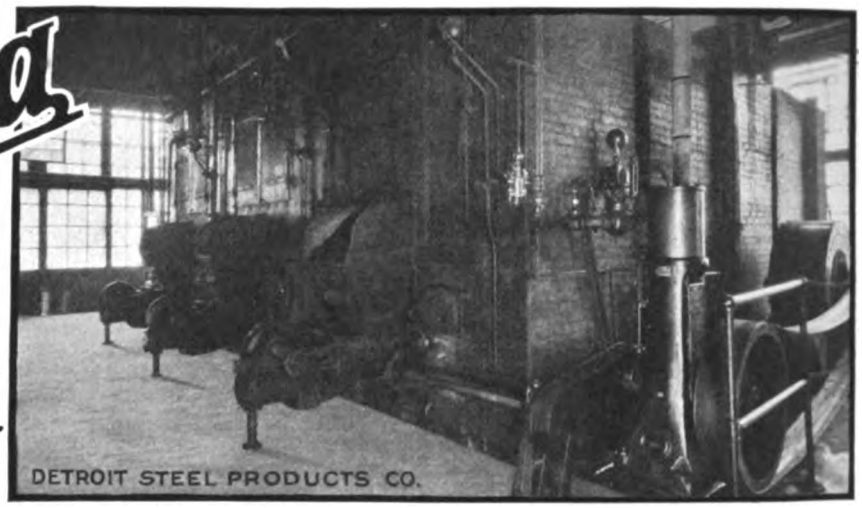
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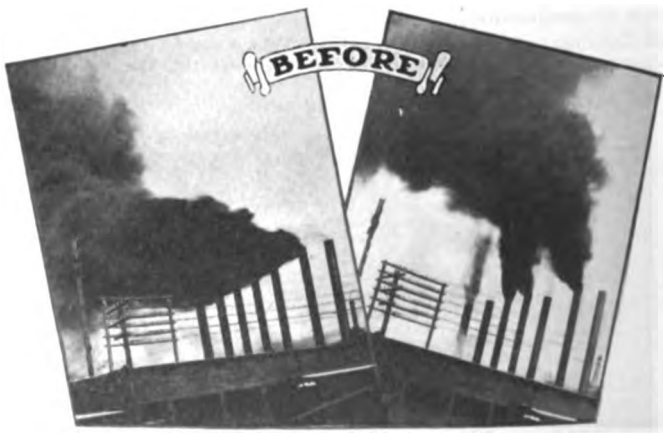
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Detroit Underfeed Stokers



The Detroit Steel Products Company, manufacturers of famous "Fenestra" Steel Window Sash, heat their plant with three 150 horsepower H. R. T. boilers. The boilers were originally hand-fired. Then fuel oil was tried, but the cost of burning oil was found excessive, and the installation was removed. In the Fall of 1923 with hand-firing, run-of-mine coal was costing them about $7.00 per ton in the bin.

When Detroit Single Retort Under-Feed Stokers were installed under these boilers in the Fall of 1923, it was found that slack coal costing $4.60 per ton could be used. In addition the evaporation was increased to the extent of two pounds of water per pound of coal. The savings effected paid for the stokers in a very short time.



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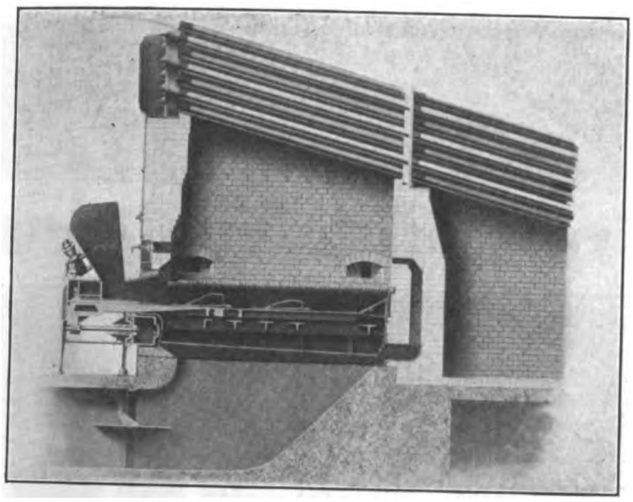


Fig. 8. The Type "E" is a single retort underfeed stoker with alternately fixed and moving grate bars situated on either side of the retort, and side ash discharges.

cation of competent advice in this respect, that the faintest suspicion of profits hidden in the boiler room should be sufficient to "call in the physician" at once.

EVERY man, woman and child in the United States has at his command six horsepower, or the equivalent of forty-eight slaves, members of the Detroit section of the Society of Automotive Engineers were told at a recent meeting by C. F. Kettering, president of the General Motors Research Corporation of Dayton, Ohio. He based his statement on the general assumption that the average work capacity of one human being is one-eighth horsepower and the calculation that the mechanical horsepower developed in this country is roughly 700,000,000.

We do not recognize these slaves, he said, but some bring water into the house, others bring light, some carry messages, and all sorts of slaves are available to relieve the individual of physical labor and discomfort. And, having been relieved from the labor and discomfort, we have more time and comfort for mental development and to think how we can put more slaves to work.

Egypt, Rome and Greece reached their highest development when they had the largest number of slaves, which increased the productive capacity of those civilizations, Mr. Kettering recalled, and he said that our own civilization has kept on growing, notwithstanding the abolition of slavery, because of the development of mechanical power. He drew a comparison with the conditions in India and China and said that, by our standard, a Chinese coolie, who works all day for the equivalent of 10 cents, is paid twenty times what he is worth, because, while he can move one ton one mile in a day at most, the railroads in America last year moved one ton one mile at a cost of half a cent, which illustrates the difference between man power and mechanical power.—*Journal of the Society of Automotive Engineers.*

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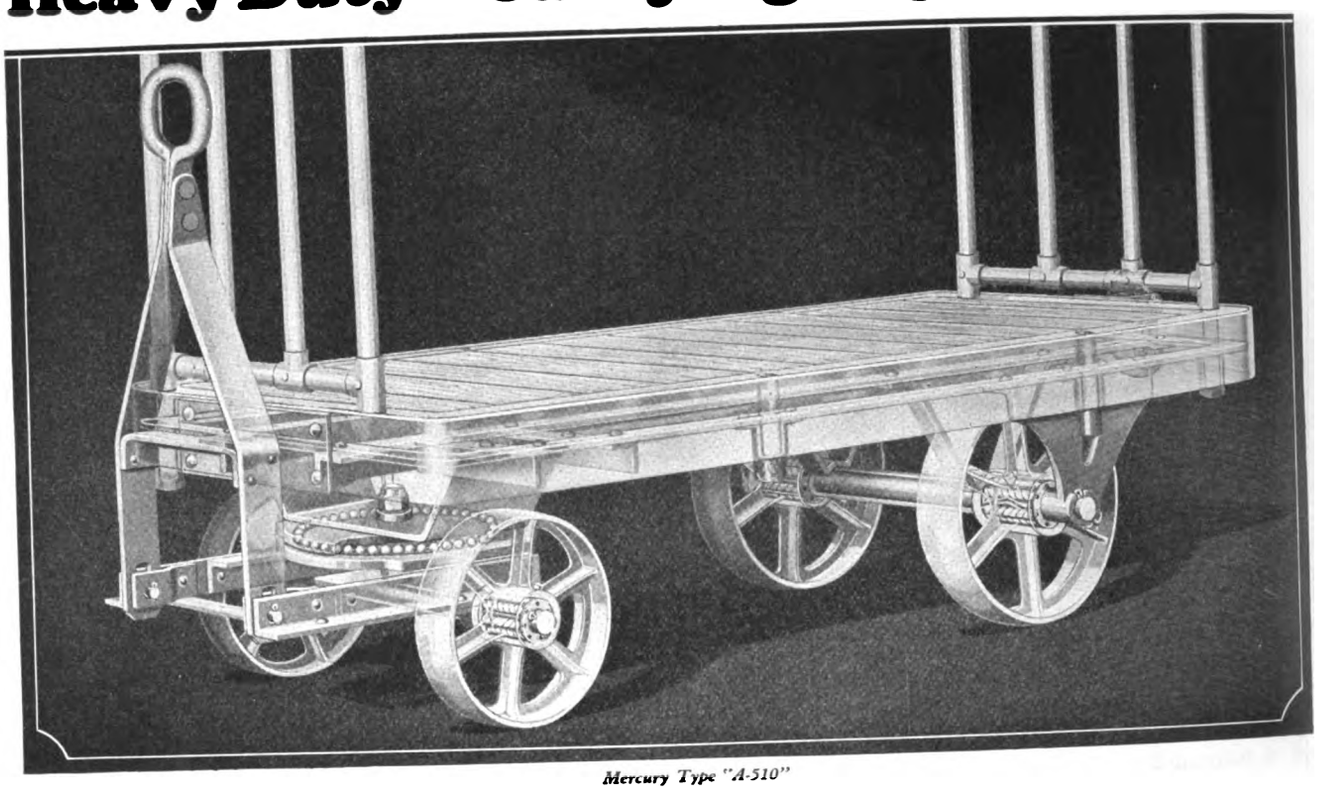


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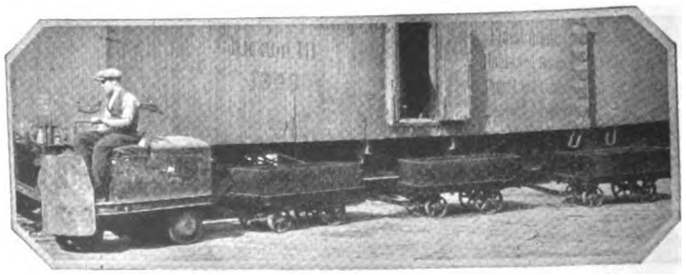
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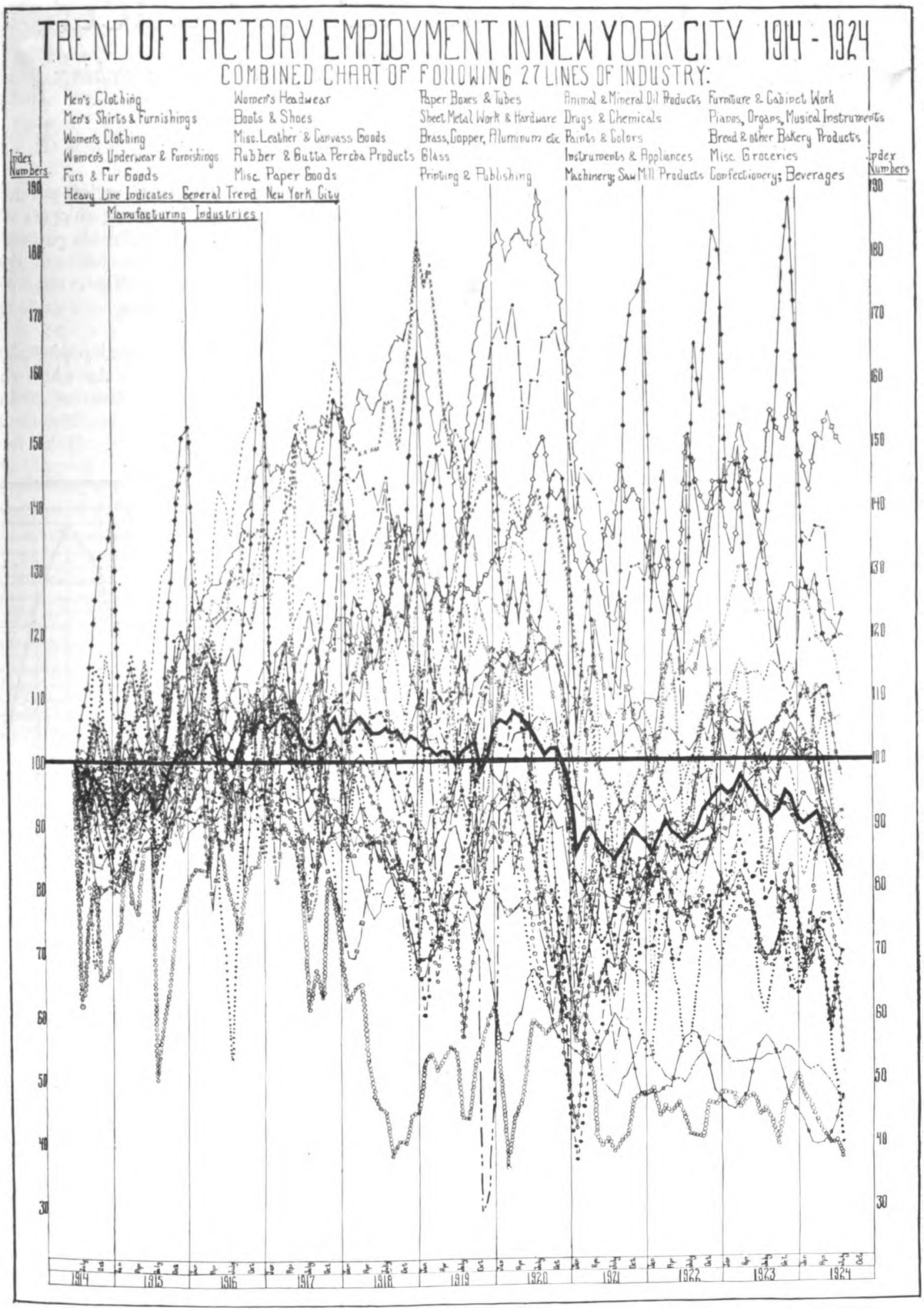
With Rubber Tires





With Box Body

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"What makes the tired business man tired" might be the title of the accompanying chart depicting the tangled course of twenty-seven important lines of manufacturing in New York City through the vicissitudes of nine years of war, industrial depression and changing fashions.

If it is the function of graphs to facilitate the understanding of facts, then this muddy picture should at once convey the idea that the course of industry is an exceedingly complex affair, and one begins to appreciate the difficulty of meeting the demand for a "steady job."

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Who Crates Your Product?

Saving Weight, Lumber and Damage by Intelligent Packing

By Earl Christmas

Graphical Visualization by Frederick H. Peard

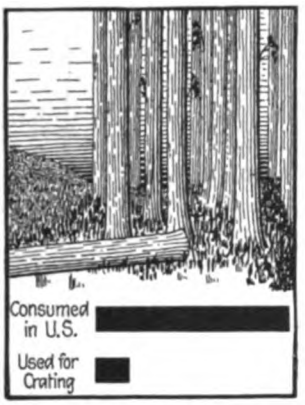


Fig. 1. Approximately one-sixth of all the lumber consumed in the United States is used for crates and boxes.

AMERICAN shippers as a rule have not been in the habit of applying a great deal of engineering skill to the making of their crates. When it comes to methods of production, the average manufacturer puts his best engineers to work. Nothing is overlooked. Labor saving machines of every kind are properly installed, and there are endless systems of conveyors arranged with the utmost skill so that production may be carried on with the greatest efficiency. But crating—"Oh, Joe or one of the other boys out in the shipping room can do that."

The illustration may be extreme, but it is typical of many shippers. Certainly, the average manufacturer has not given the same thought and care to his crating that he has given to his processes of manufacture.

The results pile up in damage claims and dissatisfied customers. If you have any illusions about the kind of packing being done by shippers, a visit to the damaged freight department of any railroad will dispel it. Haphazard crating is costing American shippers literally millions of dollars a year. The railroads pay out about $100,000,000 a year in claims on lost and damaged freight, much of it due to poor packing or improper containers, according to engineers who have made a study of the problem.

Good packing is more than a question of designing a proper container. It gets back into the whole shipping practice of the manufacturer. To illustrate, an engineer was sent out to work out a crating problem for a company manufacturing truck radiators. If he had con-

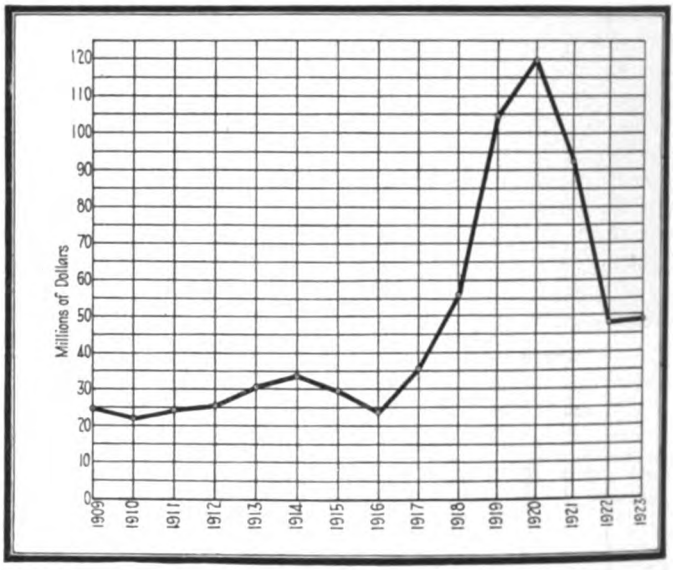
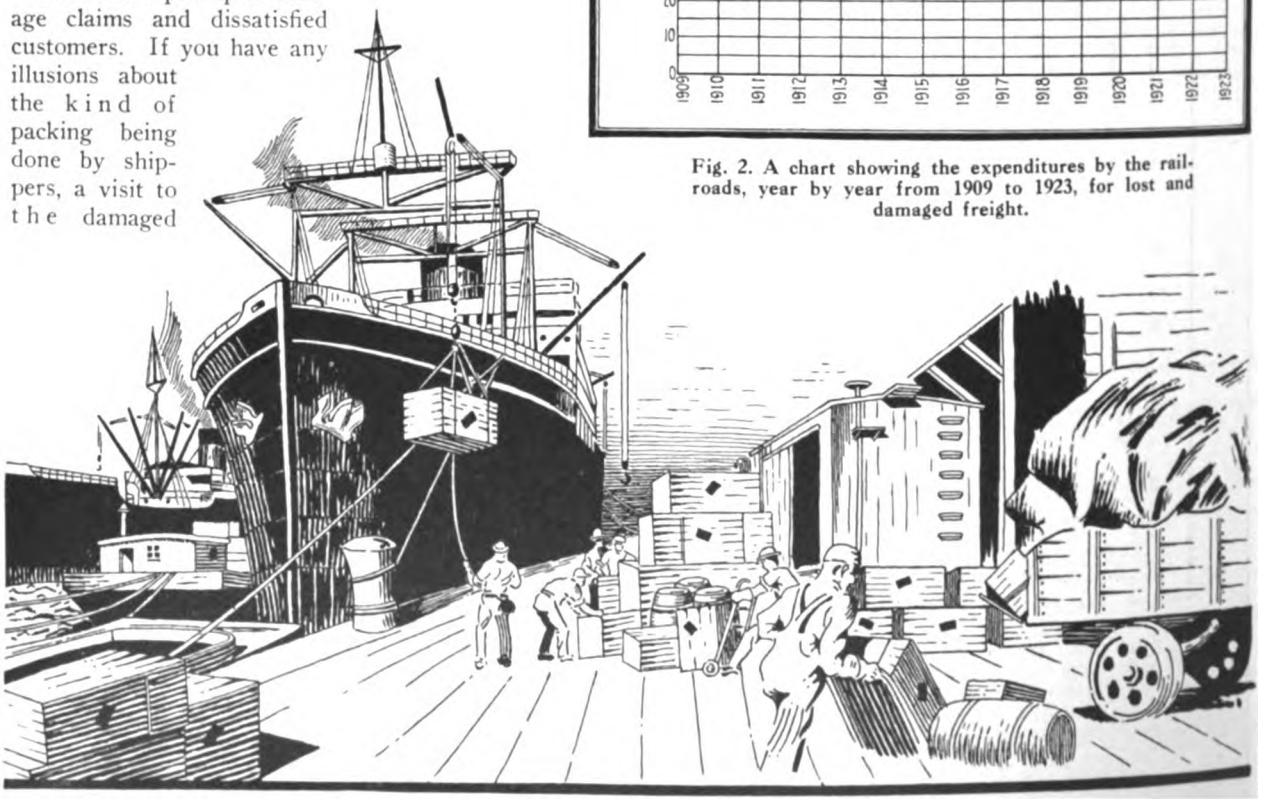


Fig. 2. A chart showing the expenditures by the railroads, year by year from 1909 to 1923, for lost and damaged freight.



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fined his attention to designing a crate that was stronger and more efficient than the crate used formerly, it is quite possible that his mission might have accomplished little.

But the engineer went farther than that. He made a little inquiry into the nature of the manufacturer's business. He found that the manufacturer was shipping largely to manufacturers in quantity. He was crating his radiators singly. The engineer suggested a crate carrying six radiators and then designed one, working out a plan of nesting the radiators in racks so that the crate with six radiators gave better protection than the single crate.

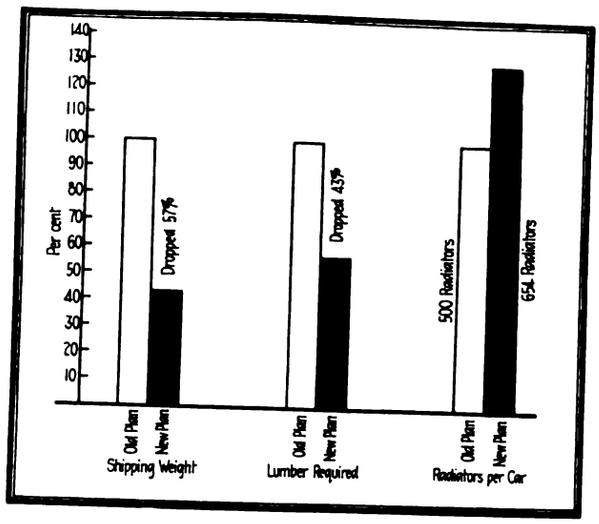


Fig. 3. What a crating engineer accomplished by revising the shipping crates for truck radiators; less lumber, less weight, and more radiators per car.

Was there economy in this change? The lumber required for crating dropped just 43 per cent. for each radiator, and there was a saving of 57 per cent. in shipping weight per radiator. It may make the result more graphic if we say that the shipping weight per radiator under the old plan of putting one radiator in a crate was 18.25 pounds, while under the new plan the weight is 7.83 pounds. The manufacturer found that he could ship 654 radiators in a car by the new system of crating where he could ship but 500 under the old plan of crating them singly.

Even small reductions in the size of packages may result in big savings when it comes to water transportation. Many manufacturers who are accustomed to shipping on land, where weight is the important thing, overlook this possibility for saving on water transportation, where displacement is the vital factor.

One manufacturer is saving $30,000 a year through the use of a re-designed crate for one export item. Of this, he figures that $6,000 is a saving in labor, $4,000 represents a saving in lumber, while the saving in water transportation amounts to $20,000.

Instances of the kind might be multiplied at length. To mention just a few cases in passing, one shipper, who uses 300 cars of crating lumber annually, reports that he is saving 25 per cent. of the lumber formerly used for one crate and 18 per cent. of the lumber which used to go into another. Another manufacturer says that he is saving 350,000 feet of lumber a year as the result of re-designed crates. This amounts to 1,000,000 pounds a year in shipping weight.

The weakest part of the ordinary crate is the corner. The common fault is to arrange the three members of the crate so that the nails holding one member are driven into the end grain of the wood and so have little holding power.

The three-way corner avoids this weakness. In this arrangement, each member is nailed to another and has the third nailed into it. Its distinguishing feature is that each member is held by nails in two directions, and the nails in each case are driven into the edge grain of the wood, which gives the maximum holding power. There are sixteen possible arrangements of this corner.

This question of better crating is not only a big issue worthy of the serious attention of the American shipper, but it is helping reduce the big loss from goods damaged in transportation, a largely preventable loss, by the way, which eventually comes out of the pockets of the public.

In addition, it represents a very practical step towards the conservation of our natural resources. Much has been written about the need for conservation. Most of the advantages from a policy of conservation naturally lie in the future, but here is a very practical means of conservation which shippers can take advantage of now, and to their immediate gain. It is a means, too, which calls for no investment in new equipment.

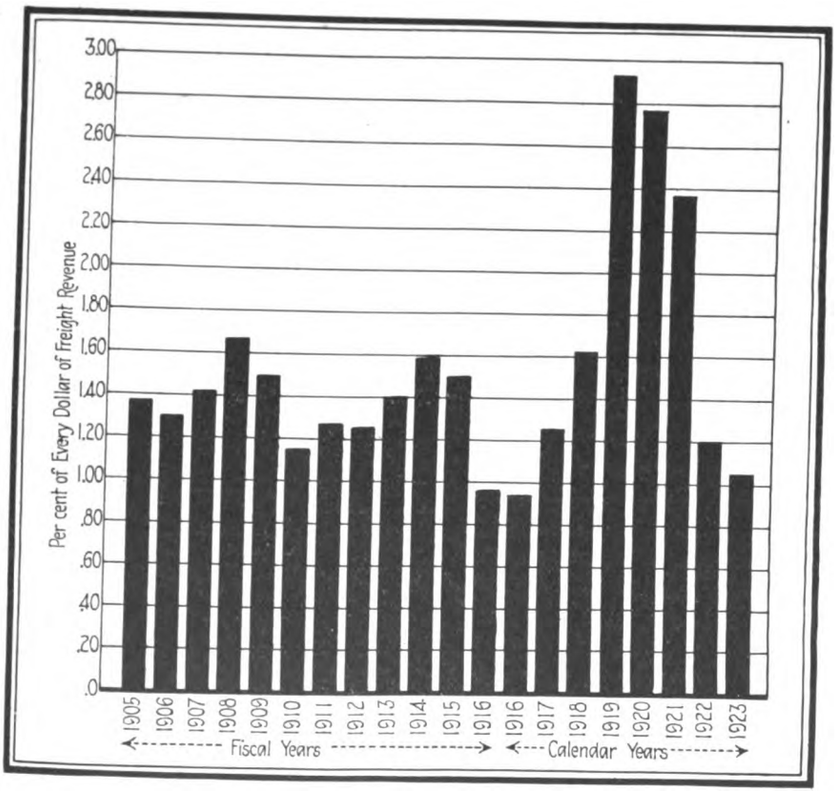
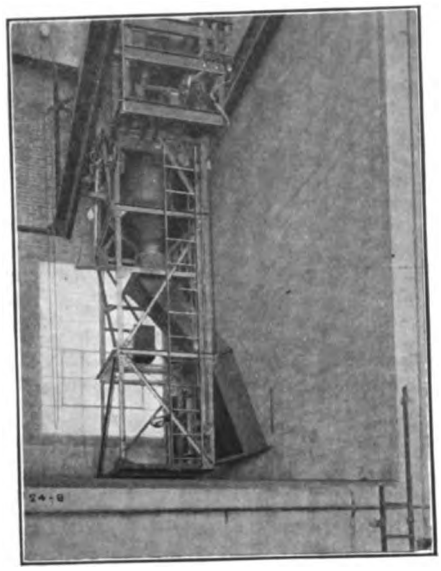


Fig. 4. Here we have the number of cents out of each dollar of the railroads' total freight revenues which had to be paid out in damage or loss claims.

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Making Savings Outside and Inside the Power Plant



Hunt Weigh Larry in the Gas Plant of the Philadelphia Suburban Co., Chester, Pa. This Weigh Larry, Hopper and Chute are completely lined with maple wood to protect metal from abrasive action of the coke.

In the eternal quest for greater and yet greater economics in the power plant, the opportunities offered by Hunt Cost-Cutting Equipment for effecting marked economies in the handling and rehandling of coal, ashes and similar bulk materials stand out in bold relief.

For over half a century Hunt Cost-Cutting Equipment has proved its economy and efficiency for performing this vital function of power production in transporting coal from car or barge, to boiler room hoppers or to storage and the removal and storage of ashes.

In testimony of the ruggedness and reliability of Hunt Cost-Cutting Equipment we can cite installations where Hunt apparatus has been in active service for from 18 to 30 years with only minor repairs.

Hunt Engineers with their over 53 years experience will gladly assist you in planning a coal, ash and bulk material handling system to meet every requirement for labor, time and money saving.

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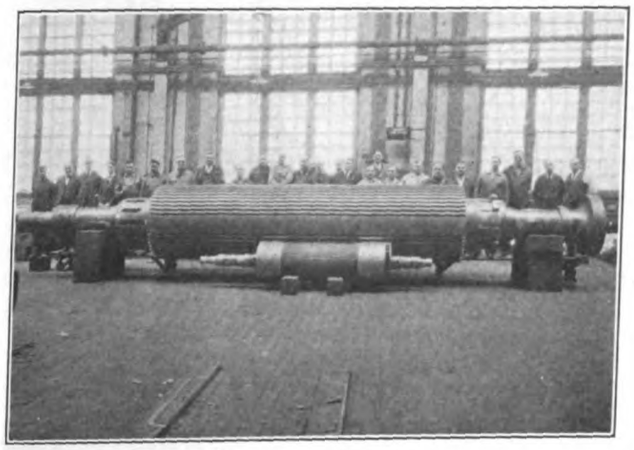
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Seventy-Eight Tons of Whirling Metal

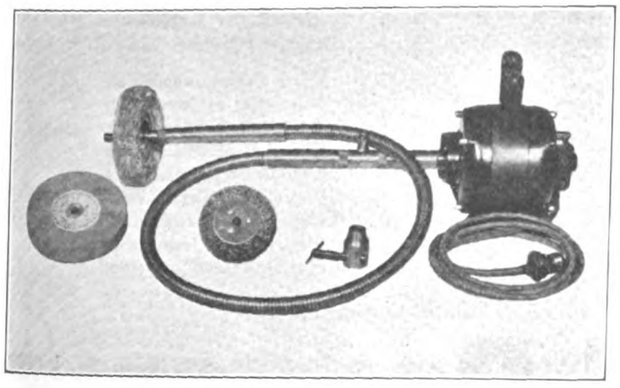
THIS rotor, or rotating element, of a 50,000 kilowatt turbine, which is being built by the General Electric Company for the Philadelphia Electric Company, is a solid piece of steel and weighs 78 tons. In spite of its great weight, however, it will revolve 1,800



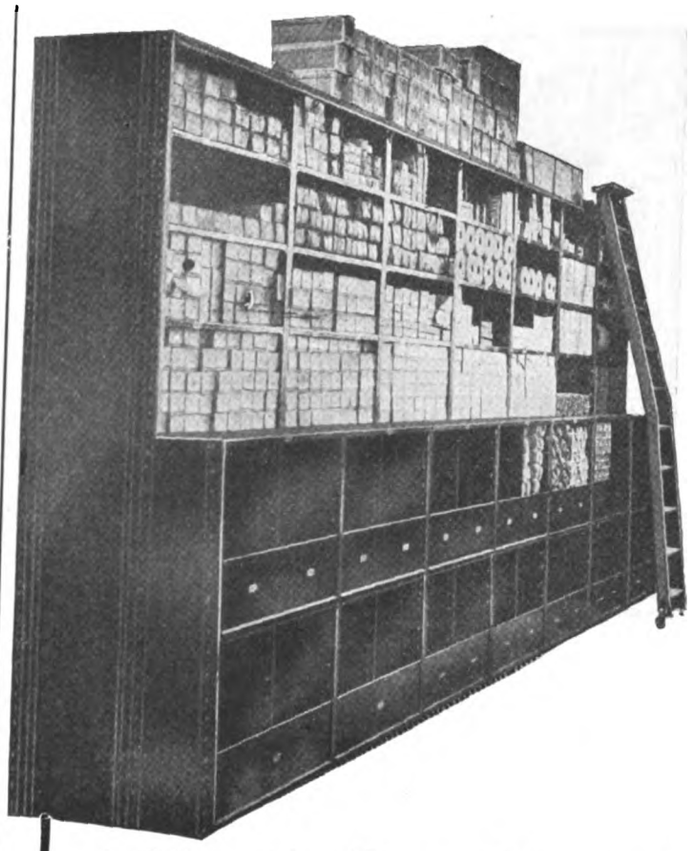
times a minute. Ten tons of steel were removed in making the slots, which are eight inches deep and 1 1/3 inches wide. The turbine of which the rotor is a part is the largest single unit turbine generator to be built in this country.

New Combination Portable Tool

THIS combination, flexible shaft tool has been recently put into production by the Stow Manufacturing Co., Inc., of Binghamton, N. Y. It is motor driven, being furnished for 110 volts, 60 cycles, single phase, for standard electric specifications, complete with flexible shaft and clamp spindle. This tool may be used



with interchangeable attachments for drilling, buffing, polishing, grinding and wire scratch brush work and similar operations, such as the operator is called to do in the maintenance of a central station, power plant, vulcanizing plant, welding plant and similar operation.



A Place for Everything and Everything in Its Place

IF you know where to look for a thing it is easy to find it. A Durand Storage-Filing System makes things easy to find.

Durand Steel Racks, Bins and Shelving are built on the unit principle of standardized sections. They lend themselves to any required arrangement and form the basis for a true storage-filing system. With such a system finding is quick and easy. Each article is definitely labelled, located and arranged in logical order.

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Durand engineers make storage space pay dividends. The recommendations that they offer for the solving of stock room problems incur no obligations.

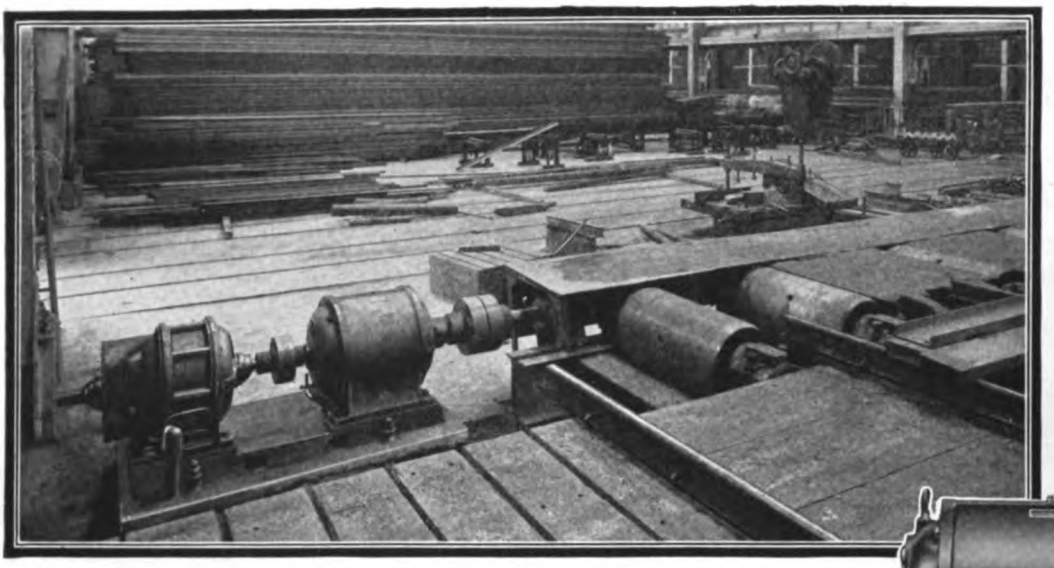
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LOCKERS BINS STEEL SHELVING RACKS

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Notice the trim, business-like way of driving roll tables that this large steel company has adopted.

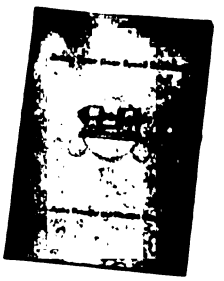
An electric motor plus a Jones Spur Gear Speed Reducer is proving here, and in hundreds of other places, an ideal combination for transmitting power and reducing speed.

Greater power efficiency is maintained on a balanced straight line drive. There are no dangerous moving parts to menace workmen. Small space is required. Inside the dust proof housing the gears operate in an oil bath. Friction is minimized. No upkeep expense is required except to occasionally replenish the oil supply.

Installation is simple and inexpensive. The reducer and motor come to you as a complete unit, mounted on the same base.

If you would like to know how speed reduction problems similar to yours have been solved advantageously we will be glad to tell you.

Our Speed Reducer Book, Number 26, will give you complete information on this better way to transmit power and step down electric motor speed. Write for it.



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IT is a clear, unbiased exposition of present day speed reduction practices. Endorsed by leading engineers and technical schools. Fifty-six installation views alone of the more than 140 illustrations. Useful tables and formulae on speed reduction.

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The Growing Woolen Industry of South Africa

By Calvin Martin

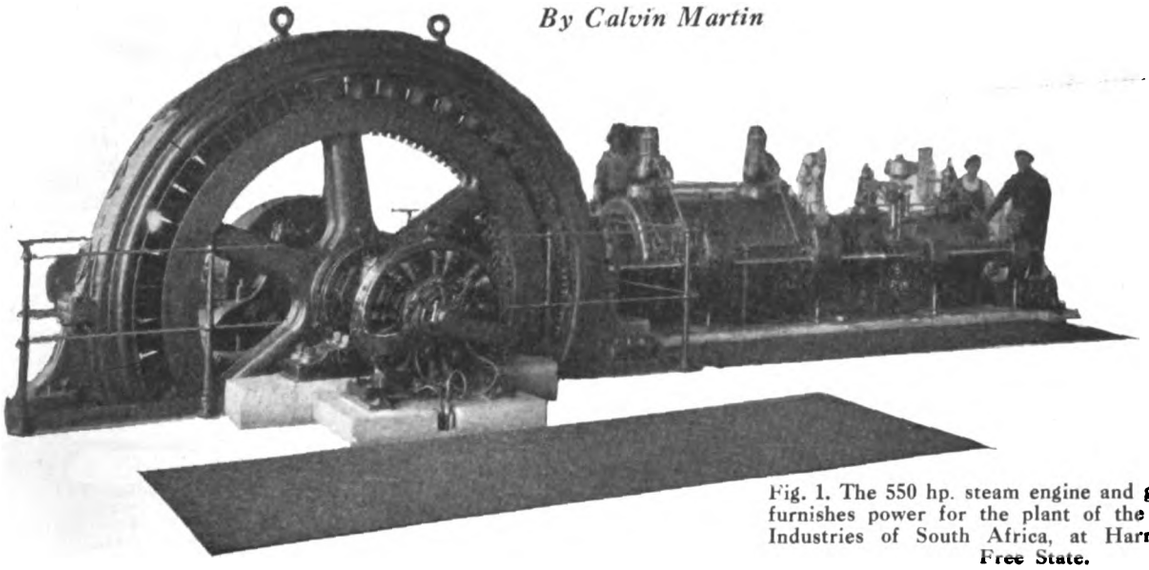


Fig. 1. The 550 hp. steam engine and generator, which furnishes power for the plant of the National Wool Industries of South Africa, at Harrismith, Orange Free State.

THE National Wool Industries of South Africa was organized about three years ago by Mr. J. W. van Aardt, with a capital of £300,000. They erected a modern plant at Harrismith, Orange Free State. This little country village stands at an elevation of over a mile high, and is reached by a direct line from Durban to Bloemfontein and Kimberly.

The entire centre of the Union of South Africa is an elevated plateau ranging from 3,500 to 6,000 feet in altitude. The O. F. S. and the Southern Transvaal is the sheep rearing country, and they are today a big competitor to Australia; in fact they claim to lead that country in the quality and quantity of their wool. Traveling through the country the farms are about evenly divided between wool, cattle and maize.

It was my pleasure to put in three days at the factory and I was very much surprised that this country was equipped with such an up-to-date manufacturing establishment. The entire building is made of concrete, the floors are concrete and the roofs are of saw tooth pattern, giving the greatest amount of light possible. South Africa is a country of sunshine. I noticed that in each room it was as light as it would be in America in the open.

The factory is all on one floor and was arranged so that when the wool is delivered from the railway, it follows on its natural course until it has been completely manufactured into rugs and cloths. They have two combined scouring and steam drying machines, nine dyeing machines, three wool purifying machines, one wool mixing testing machine, one waste tearing machine, six carding sets, ten spinning mules, with 3,200 spindles each, three warping machines, one twisting machine, one glueing and beaming machine, fifty looms, ten special Jacquard looms, one Jacquard pattern machine, eleven dry finishing machines, sixteen wet finishing machines.

All this line of machinery is driven by seventy elec-

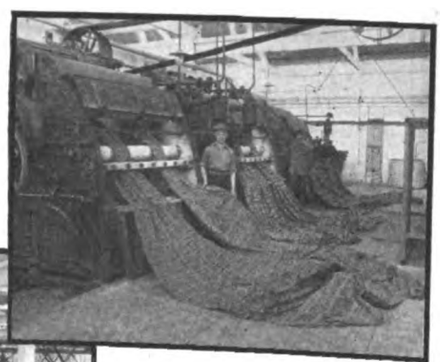


Fig. 2. Blankets find a ready market among the natives, who wear little else.

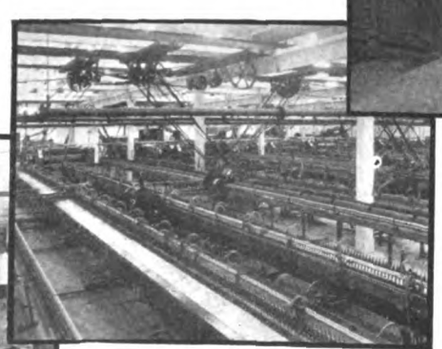


Fig. 3. The plant has ten spinning mules, with 3,200 spindles each.

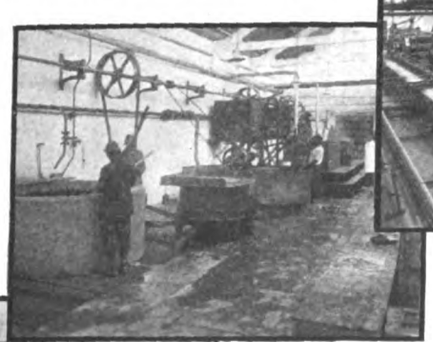


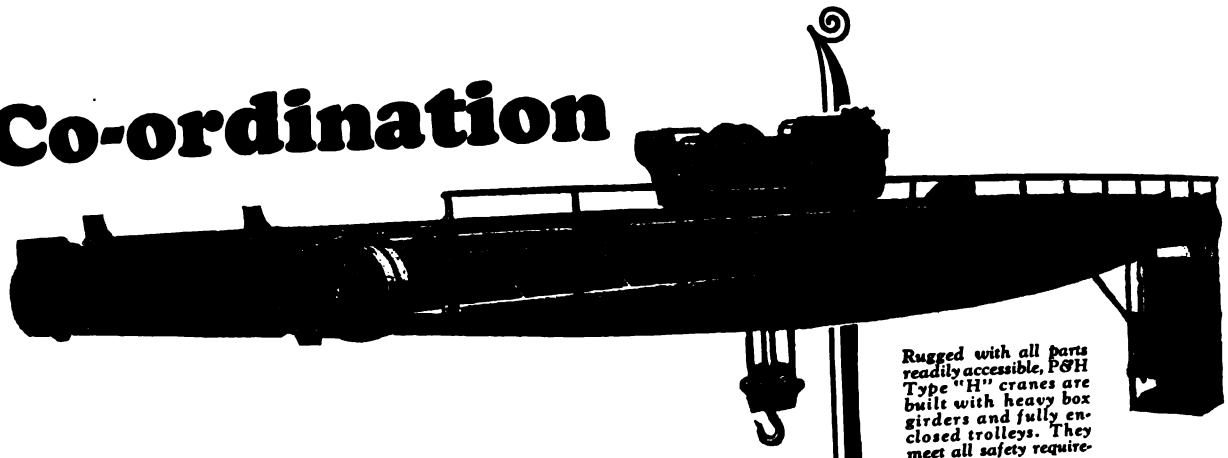


Fig. 4. Bright colors are in demand, but the natives consider certain colors to carry a "hoodoo."

Fig. 5. The plant embodies an interesting combination of native labor and the most modern machinery.

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Co-ordination



Rugged with all parts readily accessible, P&H Type "H" cranes are built with heavy box girders and fully enclosed trolleys. They meet all safety requirements.

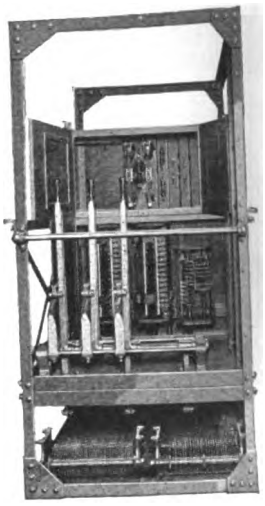
CONTINUOUS and economical operation of crane and hoist equipment is largely dependent upon the reliability of the electrical apparatus.

More than 30 years ago, P & H engineers saw that to build a well balanced crane with mechanical and electrical parts properly co-ordinated, it would be necessary to make their own motors and control. Accordingly P & H brought out a line of crane motors at that time which was far in advance of anything on the market. From then on this line has been constantly improved and expanded.

Today, P & H facilities for manufacturing crane and hoist motors and control are as complete and efficient as those of any electrical manufacturer. The machine shop is equipped with the latest tools; all special equipment required for insulation such as steam heated ovens for baking armatures and commutators; vacuum impregnating tanks for field coils; winding and taping machines; complete testing laboratory and appliances.

When you buy a P & H crane you are assured of getting the highest grade electrical equipment that can be purchased.

You are further assured of prompt service on spares, since a complete stock is carried at all times for immediate use. Why invest in a large supply of emergency parts?—P & H carry this investment in their own plant. DON'T OVERLOOK THIS IMPORTANT FEATURE.



Standard steel cab for P & H Type "H" cranes. Controllers and protective panel are completely enclosed in a sheet metal cabinet for protection against dust and moisture. Cab is exceptionally roomy, providing plenty of space for operator.

P & H D. C. motors are built to stand up under the various speeds and severe service of crane operation. They are manufactured completely in the P & H plant.

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P&H CRANES and HOISTS

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tric motors. The current is generated in the plant with a 550 hp. compound steam engine and generator. The boiler room is adjoining, and the entire steam plant is equipped with the most modern appliances for the saving of coal and heat.

"Hottest Africa" and Steam Heat"

South Africa has about ten weeks of winter during the months of June, July and August, and at this high altitude it is nothing uncommon to have the thermometer drop to 10° above during the night. For this reason, the factory is completely equipped with steam pipes so that every room has a temperature of about 70 degrees.

In addition to the list of machinery mentioned, they have a complete repair shop with modern tools, and quite an extensive private printing plant.

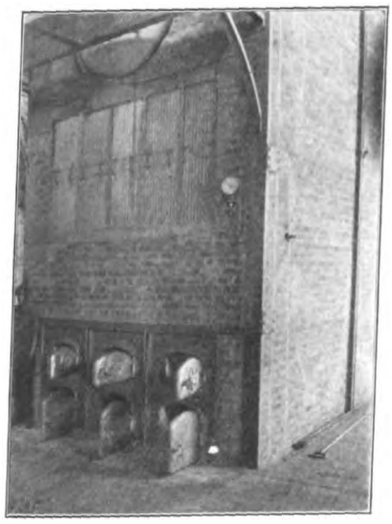


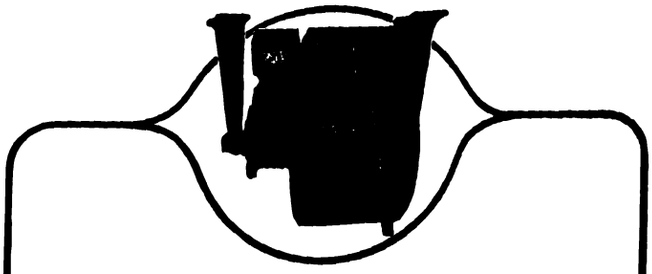
Fig. 6. The boiler room is well equipped for efficient operation, and steam heat is supplied; the temperature sometimes dropping fifty degrees overnight.

As there are about 20,000,000 natives in South Africa, and each native requires a blanket during the winter, this being practically all they do wear, you can naturally see the field that this big industry will develop. The factory at first manufactured a large quantity with stripes in blue, only to find that the native absolutely refuses to wear them as that color seems to be a hoodoo.

It has been my pleasure to go through quite a number of plants since arriving in this country. I find that in the Cape Province there are several furniture factories, one fairly large match factory, and another one just about to be started. In Cape Town they have large grain elevators, and there are several cereal factories in the country. The northern part of the Cape Province is the ostrich rearing region. Further up the coast of the Indian Ocean, we come across some sugar refineries, and up in Zululand are two more refineries. In Johannesburg there are quite a number of small factories all waiting to grow up with the country.

I notice between Johannesburg and Pretoria 21 cement factories. Of course, the big gold mines are located there. There are now fifty-one large mines, thirty-nine of which are in operation all the time, some employing as many as 10,000 people. One mine has 21 levels with the lower level over 5,000 feet below the surface.

THAT the volume of production during the period 1899-1923 increased 185%, while the number of wage earners during that time increased only 90%, is shown in a study by the National Industrial Conference Board. Both installed primary power and labor employed have decreased since 1914 in proportion to the volume of production. More goods are now being manufactured with less labor, and particularly since the war, with less machine power.



What Reelite Does for Crane Service

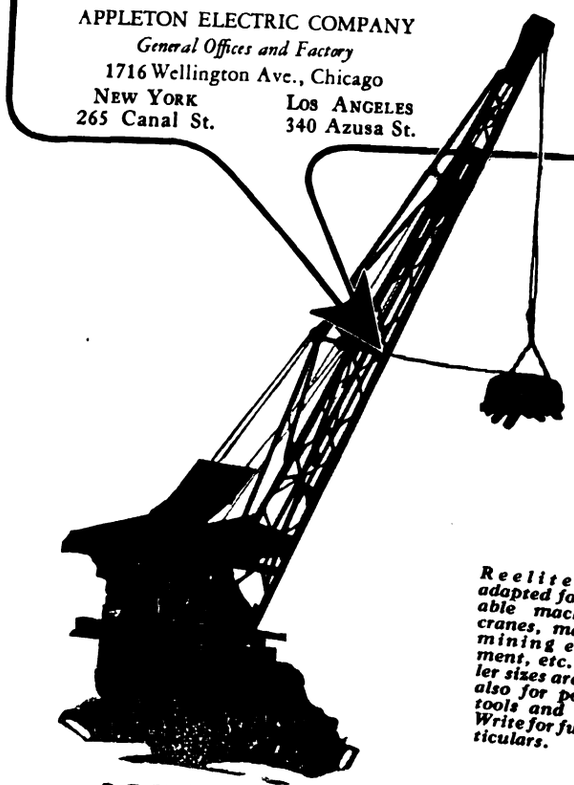
REELITE offers many desirable advantages in connection with lifting magnets on boom or traveling cranes—advantages that have made it necessary equipment for this class of work.

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"How can I stop it ?
my floors are going to *_____!"

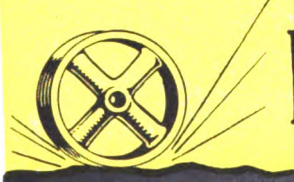
*"Rack and ruin"—the place where all floors go when pounded to pieces by relentless iron, steel, wood and fibre wheels.

Now! You can stop it with Bassick Ruboid Wheels

A new invention—an entirely new idea in truck caster wheels—new in construction—new in design—new in materials used—new in the service they give—the way they last.

Isn't this what you want?

1. As considerate of floors as rubber-tired wheels, without any of their objections—Bassick Ruboids.
2. As easy rolling as hard metal wheels, without playing havoc with floors—Bassick Ruboids.
3. As quiet and smooth as fabric or canvas wheels but at a much lower price—Bassick Ruboids.
4. As sturdy and long lasting as fibre or wood wheels—but without warping, buckling or wearing unevenly—Bassick Ruboids.



No floor can long survive the ruthless wear of noisy, hard metal truck wheels—"as much out of place on a cement surface as hob nails on a ballroom floor."

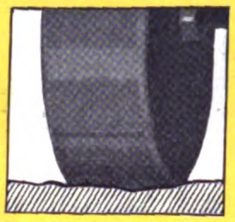
Ordinary truck wheels sooner or later ruin any floor.

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There never has been such a satisfactory truck caster wheel at such a reasonable price. Bassick Ruboid wheels roll easily, quickly, smoothly without the least harm to floors, good or bad — *and they are noiseless!*

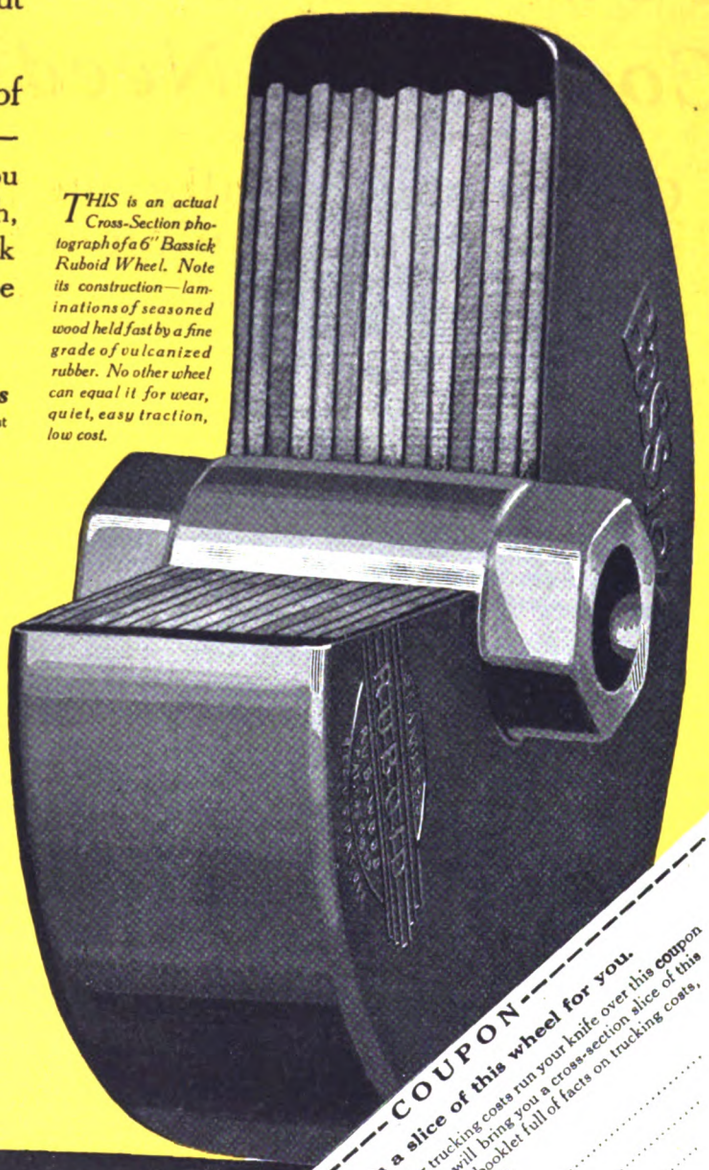
IT is new! It is even made differently. Look at the Ruboid Wheel. You know the strength of laminated wood—the "give and take" of rubber. Combined, as they are in Bassick Ruboids, they make the ideal truck wheel.

The Bassick Ruboid wheel is no experiment. It has been subjected to the most rigid tests—under heavy loads, on long hauls, over all kinds of floors—but not once has it failed to roll easier, quieter, without harm to floors.



"Give and take" is the principle of the Bassick Ruboid wheel. Semi-flexible, they are resilient enough to take the bumps, rigid enough to roll easily—but always silently!

Your floors cost good money—lots of it! They are expensive to build—costly to repair. (See chart below.) You can't afford to pound them to pieces, to crush, crack and ruin them with ordinary truck wheels—not when Bassick Ruboids can be had at such reasonable prices.



THIS is an actual Cross-Section photograph of a 6" Bassick Ruboid Wheel. Note its construction—laminations of seasoned wood held fast by a fine grade of vulcanized rubber. No other wheel can equal it for wear, quiet, easy traction, low cost.

Here's what it costs to repair your floors

Type of floor	First Cost per sq. ft.	Renewal Cost per sq. ft.
Integral Granolithic	.10	.25
Bonded Granolithic	.14	.20
Hardwood Top, Paper	.30	.18
Hardwood Top, Paper Intermediate	.36	.18
Hardwood Top, Plank	.47	.18
Hardwood Top, Plank and Tar Base	.40	.18
Hardwood Top, Intermediate Floor, Plank and Tar Base	.46	.18
Wood Block Floor	.34	.34

(Figures from a leading construction concern)

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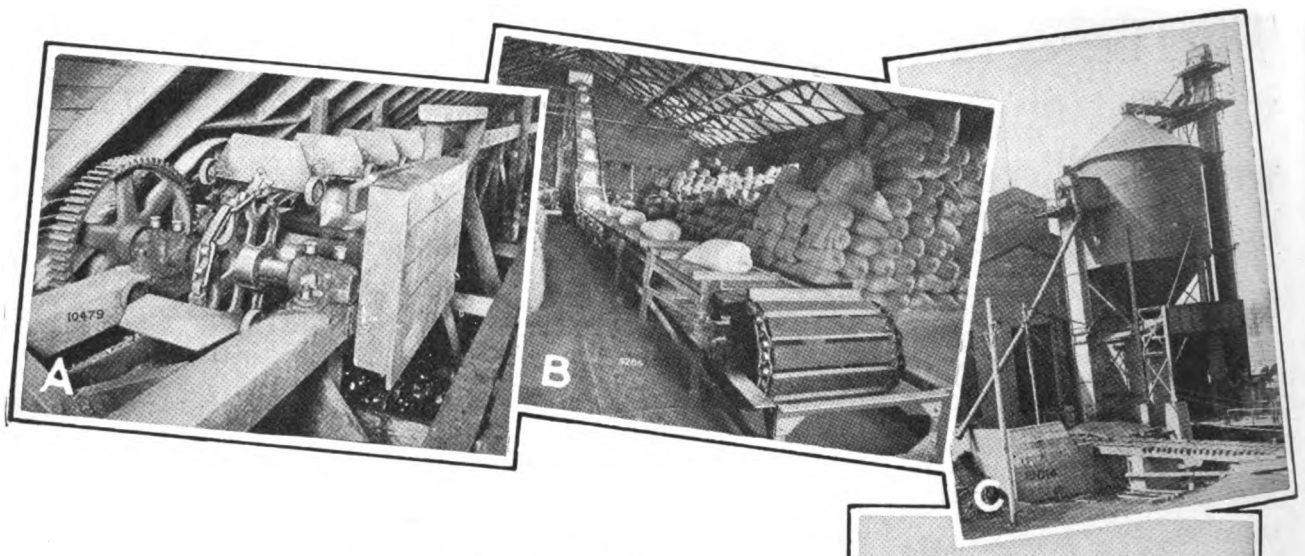
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The accompanying illustrations, showing only a few of our various types of conveyors, may suggest ways of increasing production and profits in your plant.

A—Scraper Type Conveyor distributing coal over storage bins in a glass factory.

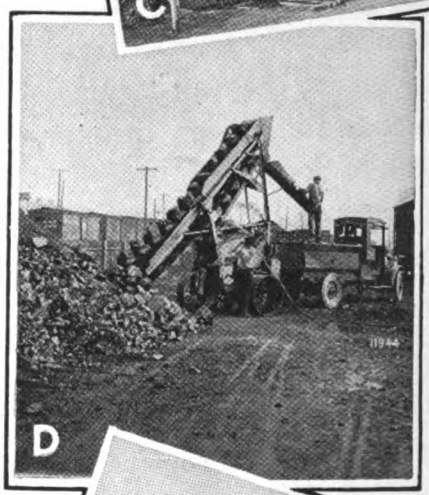
B—An Apron Conveyor handling bags on horizontal and on steep incline, into and out of storage.

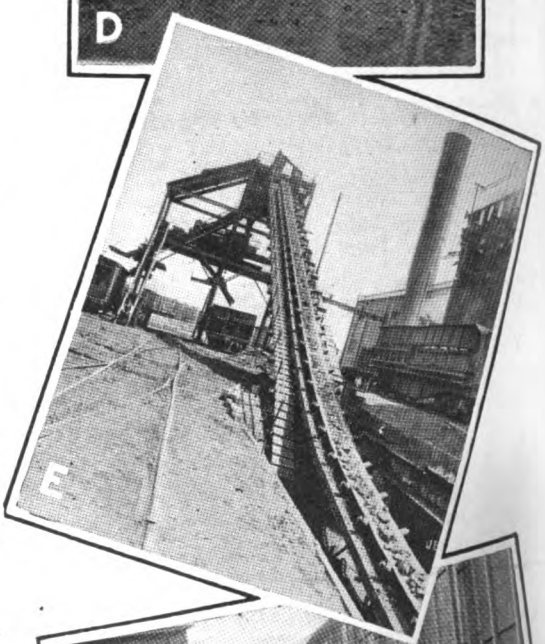
C—Bucket Elevator elevating coal from Jeffrey Single Roll Crusher to bins at Street Railway power plant.

D—Portable Loader handling coal from ground storage to truck in retail yard.

E—Belt Conveyor handling coke in a Gas Products plant.

F—Storage Battery Locomotive handling miscellaneous materials in a large industrial plant.







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MATERIAL HANDLING EQUIPMENT

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July, 1925

Cutting Down the Accident Toll

By Russell J. Waldo

THE number of accidents in our modern plants as compared to the older plants is lower by a considerable percentage. This is not only due to new equipment but to more light, more sanitary conditions and shorter working hours.

In the beginning of industry, long hours caused more accidents perhaps than any other reason found upon record. Absence of safeguards follows, with old, worn out machinery next. Carelessness and indifference to the job have caused a large number of accidents and this could be prevented only by placing men in jobs in which they were most interested and making them understand the sources of danger and the results.



Fig. 1.—After losing his left arm, this worker returns to the shop with an artificial arm.



Fig. 2. Note the sleeve protectors upon the girl. These save many an accident.

As to what percentage of accidents are due to faults upon the part of the worker and which due to mechanical reasons cannot be accurately determined.

Everywhere we go, more stress is being placed upon the foreman to impress upon his workers the results of injuries. To an almost unbelievable extent, decreases in injuries have been the result where safety committees have been organized and the foremen detailed to instill within their workers' minds the necessity for safer practice.

The number of accidents which occur in the period of the new man's learning is surprisingly large, at first thought; yet when one considers that this man knows little or nothing of the machine or task before entering his present work, it is surprising that he does not suffer greater injuries than he does. It has been suggested by many executives that the one factor which prevents accidents to him more than any other is the fact that, not knowing much, he does not take much chance. Every period of industrial depression shows a much reduced accident rate. This is due to the fact that when depression comes the least experienced men are the first to go.

The plants in the isolated communities suffer a much larger number of injuries than the plants in the larger cities. This has been traced to the fact that the plant in the smaller community does not find it possible to obtain as highly skilled men as will work in the cities.

Workers between the ages of twenty-three and forty-five, according to records, are less subject to injuries than the older and younger ages are. The younger workers do not know their jobs fully and therefore are subject to accidents; the older workers become careless. It is the worker who has a sense of responsibility, whose knowledge of his task creates within him that desire to be careful in his work.

The accident rates among workers who cannot speak the English language is dangerously high. Being unable to understand instructions, and not wanting to express ignorance of the language before other workers,

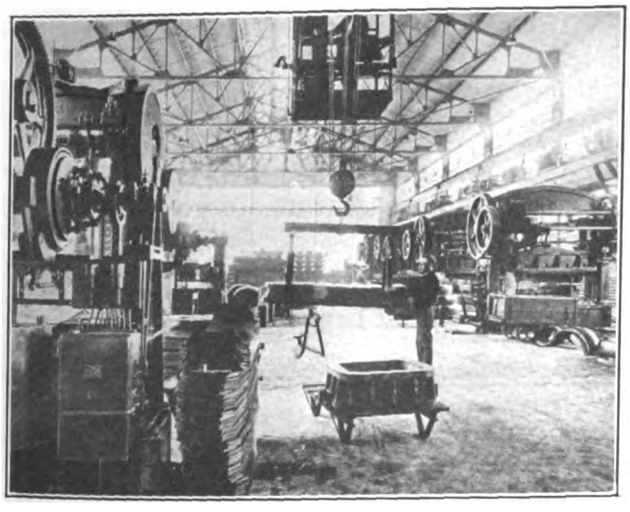


Fig. 3. The proper method of moving loads by cranes. The man advances ahead of the load to warn others.



Fig. 4. The group talking near the operator often causes his mind to leave his work and thus serious accidents are caused.

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The Invincible Cleans

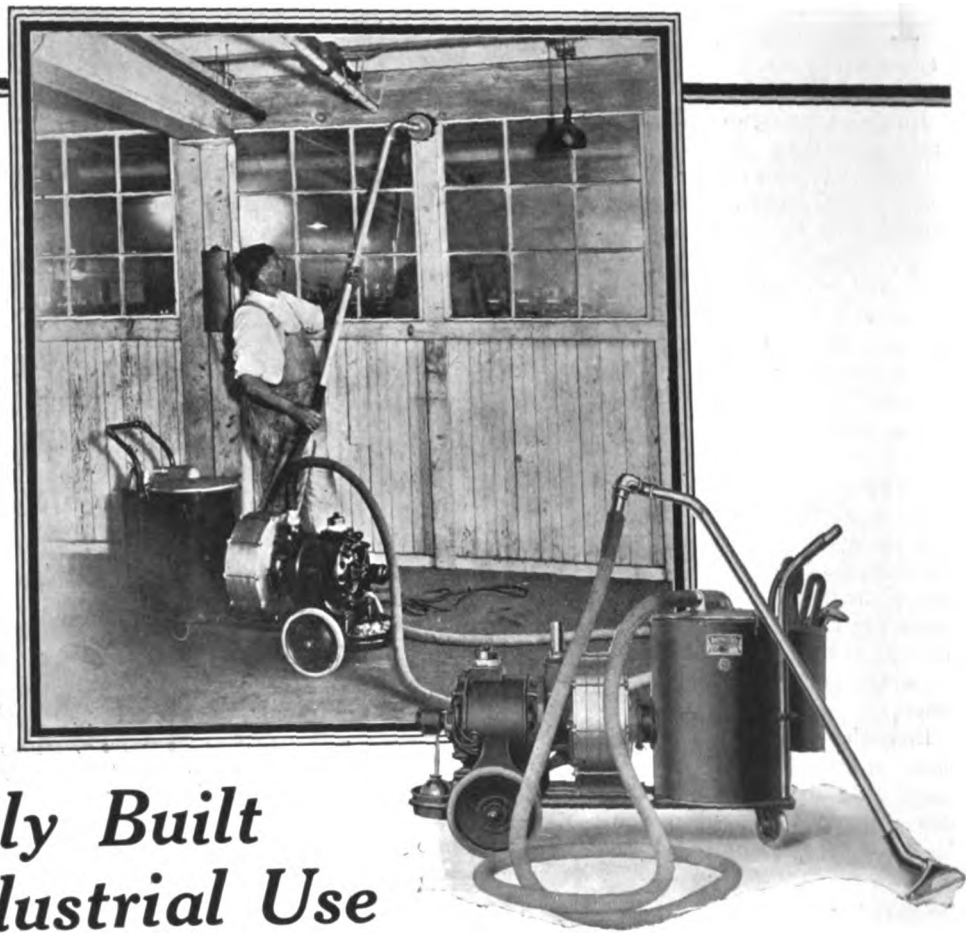
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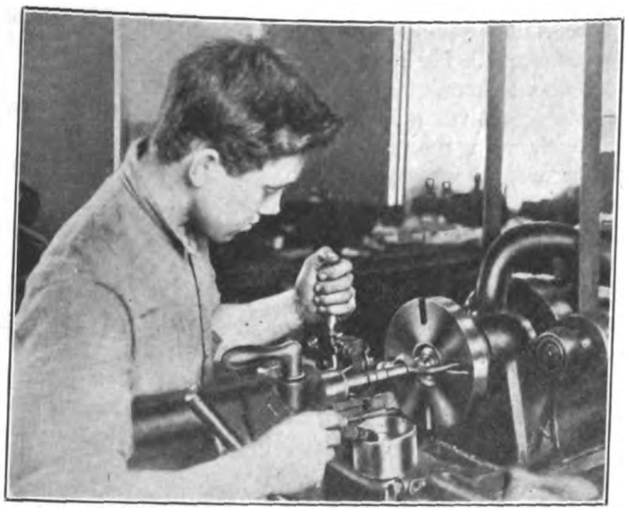


Fig. 5. Training the young workers to be more careful and to the proper handling of machines.

makes a man particularly liable to injury. However, accidents due to such causes are being reduced every day, due to the fact that employers are demanding that workers know the English language.

One of the most severe accidents the writer has examined was due to nothing more than lack of foresight by the plant management. It was in connection with a multiple spindle screw machine. The machines were set at about a forty-five degree angle and about eighteen inches apart. It was in an automobile production department and each operator was assigned to watch two machines.

The accident happened about nine-thirty in the evening, after the workers had been working evenings and Sundays for nearly six weeks. The worker lived a great distance from the plant and had a wife dangerously sick at home. The result was that he did not obtain the proper amount of rest.

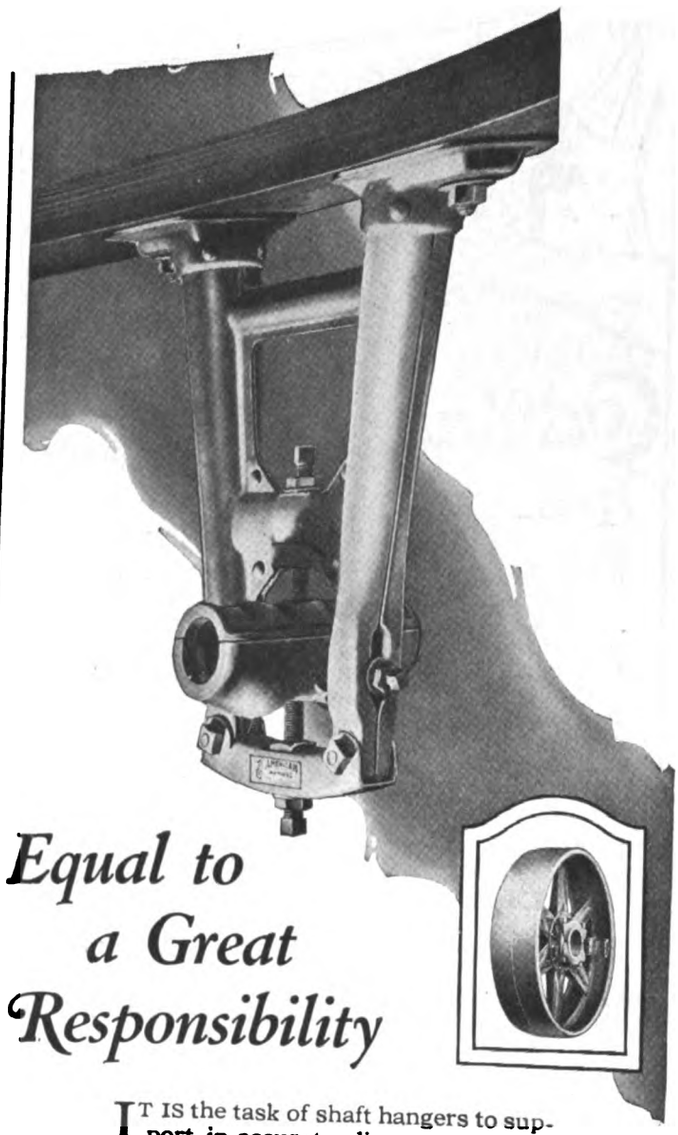
As this operator was passing between the two machines, neither provided with a guard, revolving stock caught his shirt and lifted him from his feet. A nearby worker, seeing the accident, removed his knife from his pocket, pushed the lever in the machine as he passed and immediately cut the man's collar band. This was as the machine was about to turn; only quick action prevented a fatality.

The worst part of this instance was that the company had never placed even wooden guards about the revolving stock, even though many narrow escapes from accident had occurred. The fault, of course, rested with the worker who suffered for lack of sleep and because his mind naturally was home with his sick wife. However, since the accident, the company installed movable gaspipe guards, which prevent workers from walking into the revolving stock along the passageway or between the machines.

In a Southern Indiana furniture factory, state inspectors had repeatedly advised the plant owner to place guards upon his rip saws before some serious accident occurred. He had failed to do this.

It was about eleven-thirty one forenoon when a foreigner, unable to speak English well, in forcing stock through the saw allowed his hand to slip. There was no guard to prevent and the saw went straight into his hand between two fingers and almost to the wrist.

This worker has lost the use of that hand which of



IT IS the task of shaft hangers to support in accurate alignment, power-laden line shafting and pulleys. "American" Pressed Steel Hangers are constructed to endure under this responsibility. Their design embodies the most advanced principles of sound transmission engineering.

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The Soles are of light weight, close grain selected maple. Fastened to uppers with wire by our own patented process. Men like them because they are comfortable—easy to put on and take off and keep the feet in healthy shape. They are far better for the feet—last longer and much more economical than rubber boots.

Davenport Wood Sole Shoes are made in various qualities and in all sizes. Boots may be had if desired. Write for Booklet and Price List or order samples on approval.

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course was the hand which he depended upon most for his best work. He returned to a different kind of work after about three months. Since that time, the company has placed guards upon every saw in the shop. But that will not restore the man's hand.

The writer was in a shop when a serious accident happened upon a grinding wheel for tools. He stood talking with the bunch of those waiting to sharpen their tools.

Carelessly, the man at the wheel allowed the drill to become loose in his hands and it was thrown, glancing, and cutting a big gash in a nearby worker's arm. It was the innocent man who suffered. There was no guard upon the wheel. The result was a man off three weeks with an injured arm. Since that time, hoods have been placed upon the grinding wheels and should the drills leave the workers' hands in the future, they will pass into the hood, where they can be easily removed. These

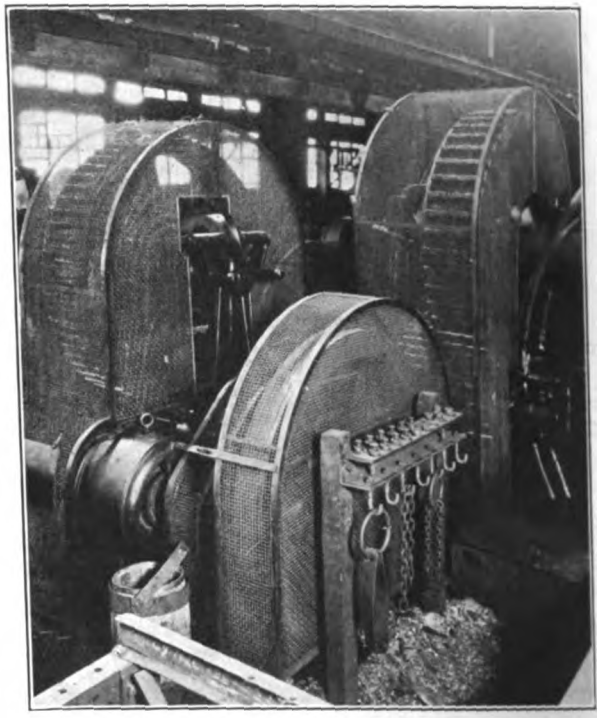


Fig. 6. Typical well guarded gears. Such measures will prevent accidents and are well worth their cost.

hoods are comparatively cheap and will save many an injury.

Jumping off and on trucks and plant locomotives has caused serious injuries everywhere. Falling objects have caused their share of accidents. The mechanical production department of the factory has had the largest number of accidents in every line of experience. The yard department comes next.

The best results in accident prevention have been obtained by organizing groups of workers to study and suggest changes to be made in the plants. These workers meet periodically to suggest changes everywhere and the work of these groups has not only reduced accidents but has awakened within the minds of workers the keen need of more care in operating machines about the plant. All the most elaborate safety measures are useless unless the workers are "sold" on the fundamental idea, because the human element remains the chief factor.

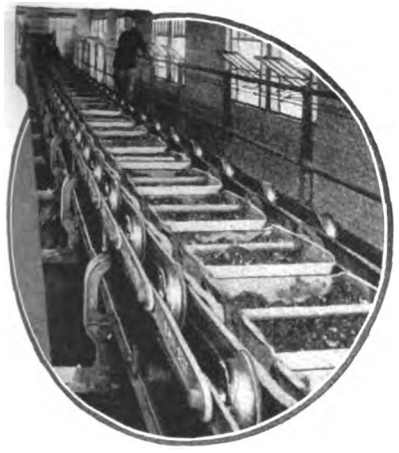
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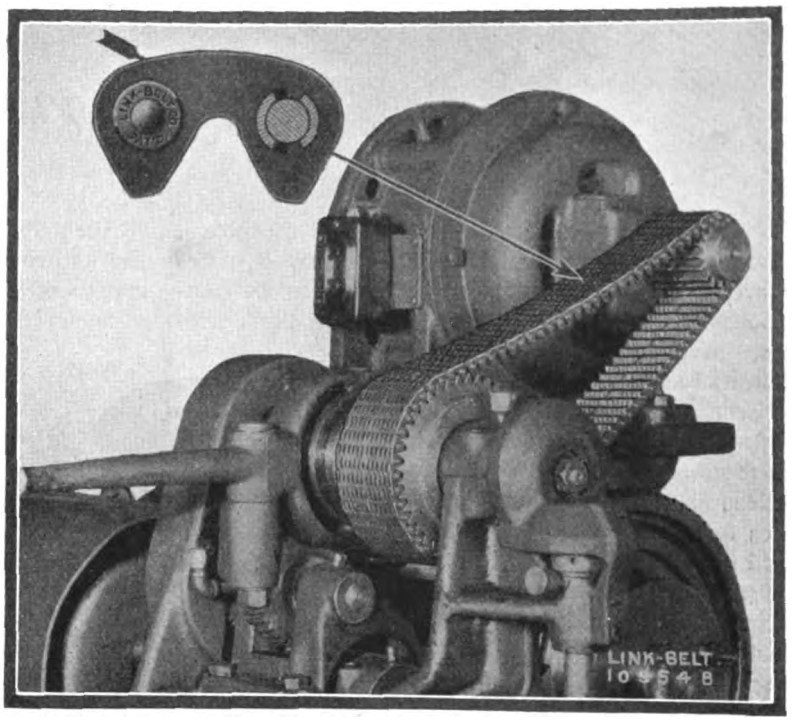
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Outside the

Where Modern Transportation and

By John

IN a generation of speed, distance is still a problem. In a country of magnificent areas, cramped spaces are yet no rarity. Modern industry, forced by competition, and directed by managers who can think with maps, leaves the old mental prison within its factory walls, and looks outside around the plant and the town, and to the far sources of its materials and the broadening horizons of its markets, in these spaces and distances to find the causes and remedies of pressing problems.

A sterling example is the Power Specialty Co. at Dansville, N. Y., an industry located in a small town, doing an international business at lowering costs. It makes superheaters and economizers, and oil stills, selling to public utility power stations, steamships, and oil refineries. Dansville is fifty miles south of Rochester and the same distance east of Buffalo.

Adequate space here means two things: first, a factory site allowing for the most efficient lay-out of buildings and therefore internal operations, and for the receiving of materials and shipment of products; and second, a town where comfortable homes and gardens and sane living create a working force unharried by high living costs or aesthetic ugliness, and where the general roominess means quick

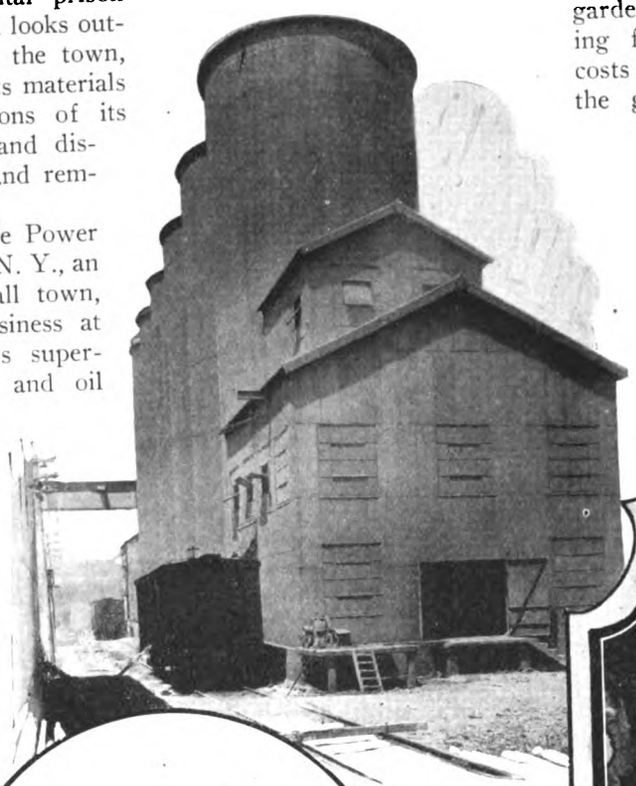


Fig. 1. From these towering storage silos, cement is loaded into four cars at the same time, two on each siding, at the Signal Mountain Portland Cement Company plant.

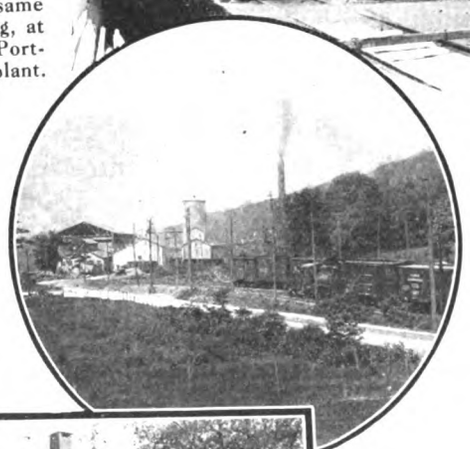


Fig. 2. Great plants with heavy materials need first-class railroad service. The Signal Mountain Portland Cement Company at Chattanooga, with sidings connecting with the Southern Railway.

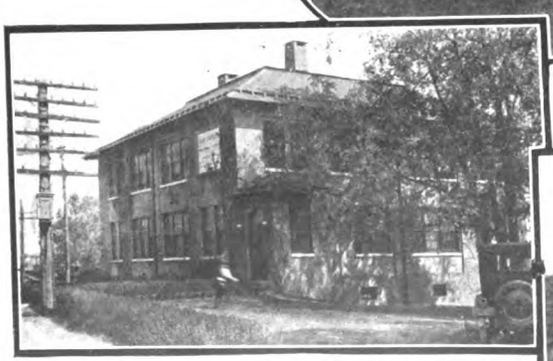


Fig. 3. Administration Building of the Power Specialty Co., directly across from factory buildings, and commanding a view of all outside operations.

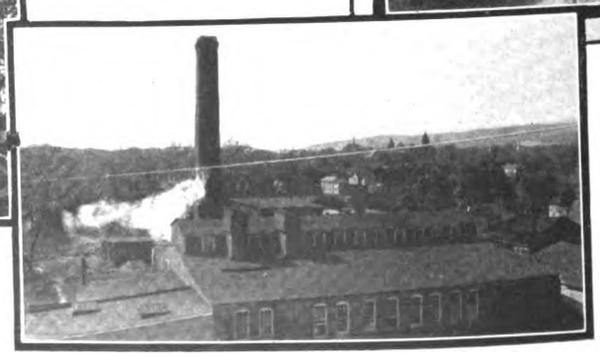




Fig. 4. Modern highways rivers providing transp tion and power are inc ingly important to ind Lookout Mountain Hig and the Tennessee near Chattanooga.

Fig. 5. The Carso Company, with the lined streets of Da adjacent.

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July, 1925

Factory Walls

Spacious Sites Mean Economical Operation

A. Piquet

railroad shipments to all points of the compass.

The interplant tracks form a miniature railroad system outside and inside the whole ensemble of site and shops.

This industry is on a short line, the Dansville & Mount Morris Railroad, connecting at Mount Morris fifteen miles northwest with the Pennsylvania and Erie Railroads. The managers of this road live in Dansville. They are neighbors of their customers. Likewise, they are within quick touch of every freight situation.

The result is that the Power Specialty Co. and others are in reality on a belt line connecting with two trunk railroads, each eager for the business. Good service has resulted. Local service is the same. The Blum Shoe Company and the Owen Publishing Company, shipping in small and large lots to every state, claim that part of the reason for their impressive growth is due to quick delivery and quick outgo.

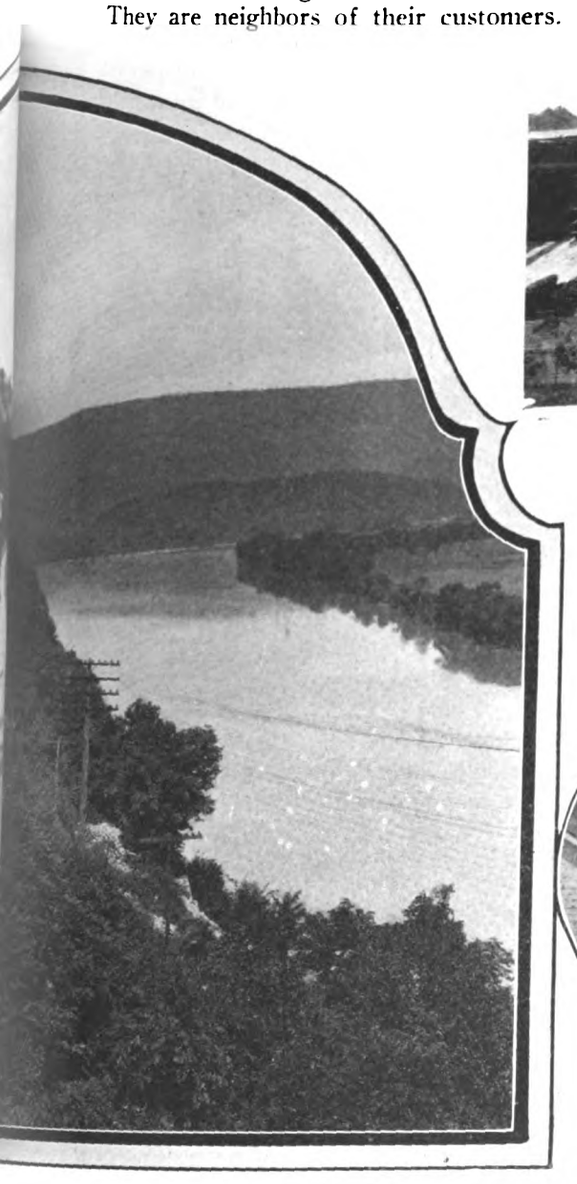




Fig. 6. A spacious site with several sidings and room for all outside operations and well-laid out buildings. See Fig. 7.



Fig. 7. All outgoing material of the Power Specialty Company comes to this yard, where the ten-ton traveling crane loads it direct from loading platforms to cars on two sidings.

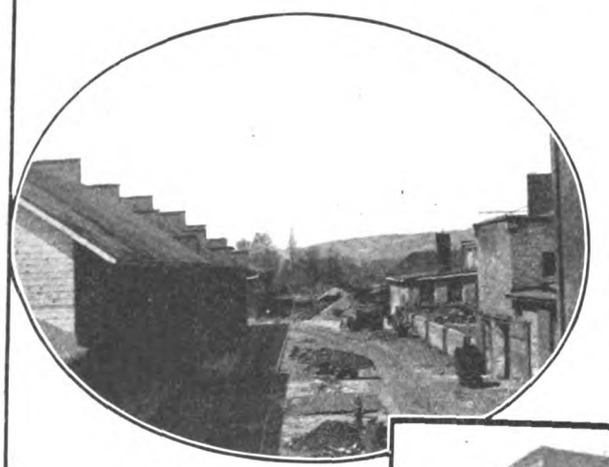


Fig. 8. Coke and boiler tube storage and pattern shop of the Power Specialty Company on the left. Fluxing stone and pig iron storage on right.

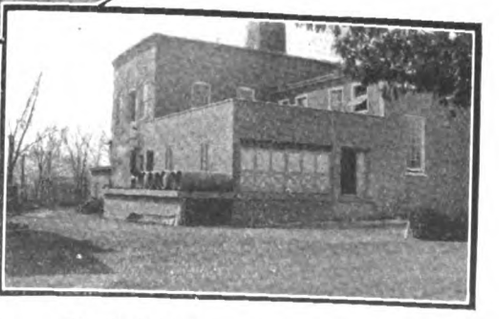


Fig. 9. Chlorine, used by the Carso Paper Company, is shipped in these tanks from the chemical industries at Niagara Falls, fifty miles away.



Fig. 10. All incoming material of the Power Specialty Company, pig iron, coal, sand, are unloaded by this fifteen-ton track crane, operating on the numerous rail sidings.

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PYOTT FOUNDRY CO.



POWER SAVING TRANSMISSION EQUIPMENT



WE manufacture a complete line of transmission equipment with the one object in mind, the delivery of the maximum power to the machines. You will, therefore, find that users of PYOTT cast iron pulleys, fly wheels, bearings, sheaves, and other transmission equipment, know economical power operation.

Write for General Catalog No. 28 which describes the complete line.

PYOTT FOUNDRY CO.
328 NORTH SANGAMON ST.
CHICAGO, ILL.

Manufacturers of
Pulleys, Sheaves, Sprocket Wheels,
Moulded Tooth Gears, Fly Wheels,
Power Transmission Machinery,
Grey Iron and Semi Steel Castings.

PYOTT FOUNDRY CO.

In this well laid out little town between high hills of beauty and recreation, the managers and their workers meet outside as well as inside working hours. At social clubs, on the nine-hole golf links, at civic gatherings, at the summer-bungalow colony on a nearby lake, getting-together means working-together. Here the boss is not feared. You cannot fear one whom you play with.

The crucial test is costs. When the sales office in New York must make a certain price to obtain an important contract, the manager goes to his friends, the workers, explains the situation, tells them, with the aid of a platform blackboard, just how their part can be played in this effort for low-cost production, and gets coöperation.

The Power Specialty Co. has 350 men, is growing, and prospering. The cars of the workers fill large garages and sheds. The brains and brawn inside these factory walls function soundly and well, for the space, the facilities, and the environment outside the walls are harmonious and efficient.

Dansville is an example of the small town, from which industry sprung, and to which many industries are returning. The type of localities which are growing the



Fig. 11. Storehouse for small parts and supplies which are delivered direct from cars, or from trucks from railroad freight house. Power Specialty Company.

fastest industrially, however, are the cities of from 50,000 to 100,000 population. Such a place is Chattanooga, Tenn., and again the factors outside of the plant are very largely responsible for this city's diversified and impressive manufacturing growth.

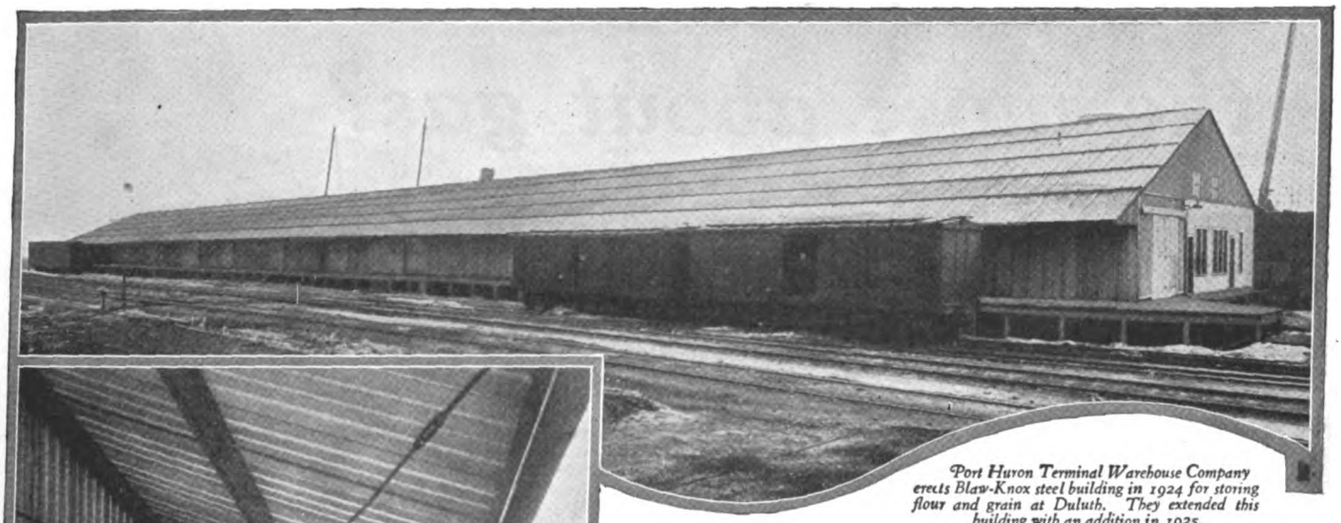
There are nine rail lines radiating from the city, to the North's great industrial areas, and south to the markets from Savannah to Texas. Four of these are part of the Southern Railway system, which through its industrial development department has made a scientific study of the shipping problems of industries along its lines.

The new and large Signal Mountain Portland Cement Company plant on the outskirts of Chattanooga is another example of an efficient site and good transportation. The movement of heavy materials is almost entirely by gravity, due to the planning of the plant buildings on a sloping site.

We thus see in Chattanooga and in Dansville how each single industry depends intimately on conditions and factors well outside of its factory walls; how outside facilities and space react in internal costs; and how high-grade businesses can thrive and be maintained only in communities with high-grade civilizations.

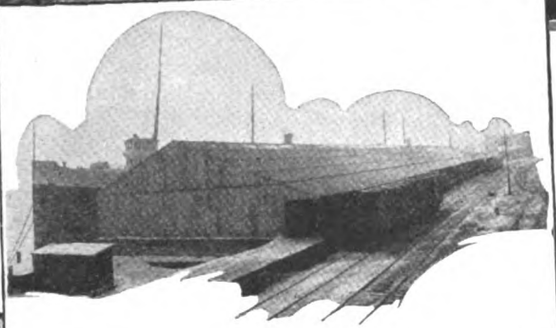
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Wherever railroads go—
You will find BLAW-KNOX steel buildings



Port Huron Terminal Warehouse Company erects Blaw-Knox steel building in 1924 for storing flour and grain at Duluth. They extended this building with an addition in 1925.





ALONG the trunk lines of our great railway systems, where industry "backs up" to receive its freight and transport its product, one-story steel buildings are in great favor. Their sectional principle of construction, which permits of dismantling without waste when it becomes necessary to remove them to different locations, is a most desirable feature. The land adjacent to railroad property is far too valuable to be encumbered with costly masonry structures which cannot be changed without total or partial loss.

But just as there are differences in material and in the human ability to construct, so is there a marked difference in the appearance, quality and endurance of these steel buildings.

In Blaw-Knox *Time-Tested* buildings you have the refinements of construction and the proofs of long life, leakproof serviceability, and resistance to corrosion, fire, and rough usage, which the records of fifty years disclose. Their low cost and low upkeep recommend them for all one-story purposes over any other form of construction.

Blaw-Knox methods provide for meeting your exact specifications from standard parts—and immediate shipment and quick erection are guaranteed. One order covers everything. Send for complete descriptive literature and prices.

BLAW-KNOX COMPANY, PITTSBURGH, PA.
680 FARMERS BANK BUILDING
District Sales Offices

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BUFFALO	BIRMINGHAM	BALTIMORE	9500 Quincy Ave.	231 No. 12th St.

BLAW-KNOX
All purpose, one story Buildings

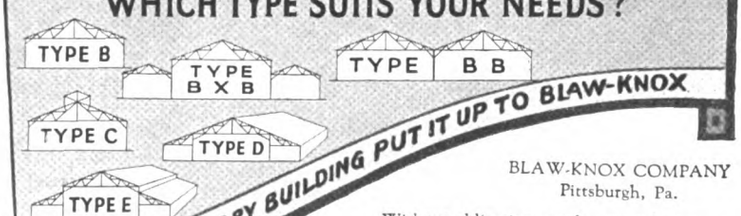
No Nail or Screw-holes—Absolutely Waterproof

"Our experience with Blaw-Knox buildings thus far has been most satisfactory. We are using one building here at Duluth, 80' x 110', for the handling of flour shipments and for flour storage. And another building, 60' x 500', is being used for the same purpose by the Port Huron Terminal Warehouse Company at Port Huron, Michigan.

"We feel that these buildings are far superior to the ordinary sheet steel structures, in that they are absolutely waterproof and almost impervious to the elements, because of the fact that the sheets have no nail or screw-holes in them. In short, we feel that the extra money required for the purchase of Blaw-Knox type buildings is well spent."

H. T. HOOPES, Secretary
McDougall Terminal Warehouse Company,
Duluth, Minnesota.

WHICH TYPE SUITS YOUR NEEDS?



IF IT'S A ONE STORY BUILDING PUT IT UP TO BLAW-KNOX

BLAW-KNOX COMPANY
Pittsburgh, Pa.

Without obligation, send me your literature.
We have in mind a building, Type_____
Ft. long_____ ft. wide_____
To be used for_____
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Who knows the most about gas?

Manufacturers know what gas can do for them. But how to apply gas is the big question in their minds, for they know that gas, like any other production tool, can be rightly or wrongly used.

Our Consulting Service Division has behind it over twenty successful years solving industry's gas problems, extending the utility of gas, and increasing the efficiency of gas applications, working direct with the gas user or cooperating with the Public Service Company. The firms we have served make a blue-book of American Industry.

To get the maximum in gas service and economy, you must apply it rightly. A very small economy will pay in a very short time for the slight charge we make, and from that time on, that economy pays you dividends.

Ask for the details of the Consulting Service's work and methods.

Smith Gas Engineering Co.
Dayton, Ohio

The Smith Gas Engineering Company (Manufacturing Division) manufactures the following equipment:

Smith Recording Gas Calorimeters. Tar Extractors. Smith Gas Valves. Recuperators for furnaces and ovens. Special gas furnaces. Bunkers, bins, and storage tanks of every kind. Scrubbers, condensers, and coolers for by-product and coke oven plants. Garbage disposal and rendering plants. Trench digging machines for public service pipe lines.

Smith achievements

The application of gas to furnaces and ovens of many kinds in many industries.

The design of the most efficient and modern fuel plants for the food baking industry.

The designing of special furnaces for special purposes.

The designing of highly efficient metal recuperators for furnaces and ovens.

The designing of metal recuperators for coke ovens which have greatly lessened the cost of construction.

The developing of instruments for recording the heating value of gases.

Extending the utility of gas to many refined heating operations where accurate control of processes is necessary.

The developing for the Delco-Light Company of a thoroughly practical and highly efficient gas producer of very small size for operating farm lighting units in those countries where liquid fuels are very expensive.

Applying gas to foundry core baking and drying molds, baking foods, baking carbons, firing pottery, operating gas engines, japanning, annealing, heat treating and melting glass and soft and precious metals.

During the last three years work has been done for such well-known concerns as the following:

Aluminum Company of America
Indian Refining Company
Kellogg Company
International Harvester Company
Standard Sanitary Manufacturing Company
Ford Motor Company
National Biscuit Company
Mutual Potteries Company
Shanghai Mint, Shanghai, China
Ganga Glass Company, Delhi, India
Vacuum Oil Company, Alexandria, Egypt

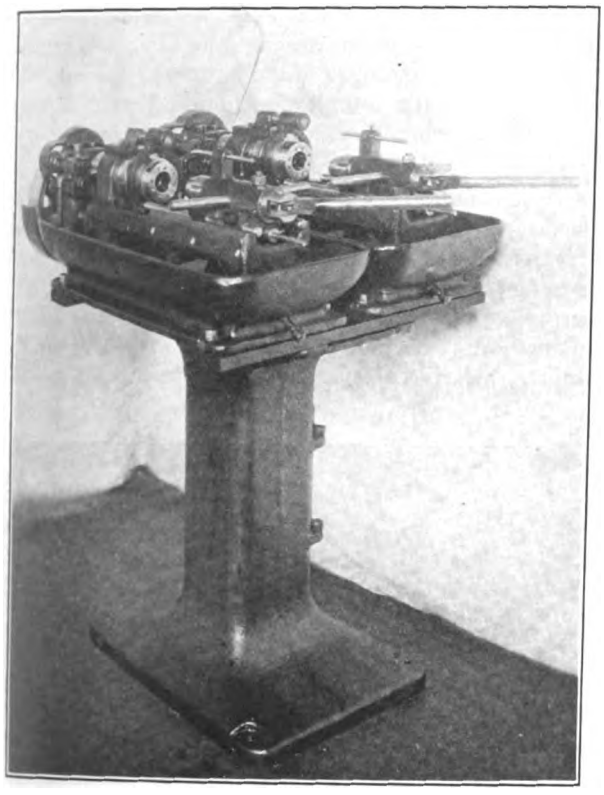
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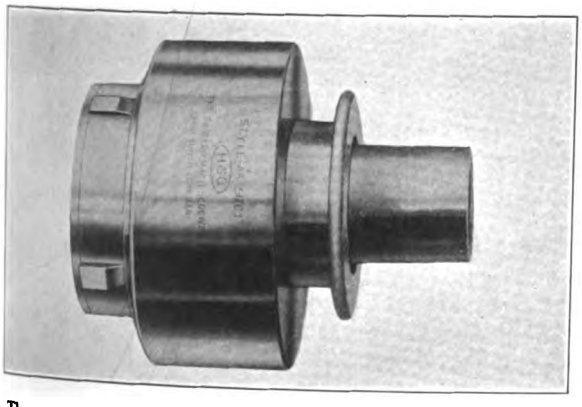
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New Threading Equipment

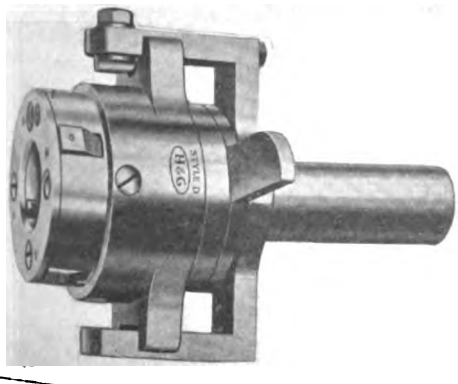
THE Eastern Machine Screw Corporation of New Haven, Conn., have recently produced the threading machines and die heads shown below.



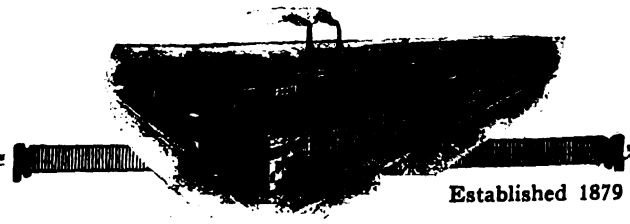
Second Operation Threader, which is furnished for single, double, triple or quadruple head mounting.



The new style AA. H & G die head for drilling machine automatics where the die head rotates. Below, style D double drive stationary head for B & S Automatics.



MEDART



Established 1879

Everything in Line Shafting Equipment

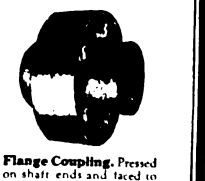
Medart probably still is the only manufacturer producing—in one plant—a line of mechanical power transmission machinery in its entirety. In this large plant is produced Turned and Polished Steel Shafting, Couplings, Hangers, Bearings, Friction Clutches, five types of Pulleys, Gearing and kindred appliances of every description.

Standardize and economize — use Medart line-shafting equipment exclusively and get the full benefit of concentrated buying, prompt and accurate service and prices that are uniformly satisfactory. Served by 26 railroads out of St. Louis, we can offer quick, dependable deliveries to industry everywhere.

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(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh and New York
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Flange Coupling. Pressed on shaft ends and faced to insure accurate alignment.



Drop Hanger. Double brace, four-way adjustment, with either ring, collar, wick or plain oiling bearings.

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It Pays to Crescentize

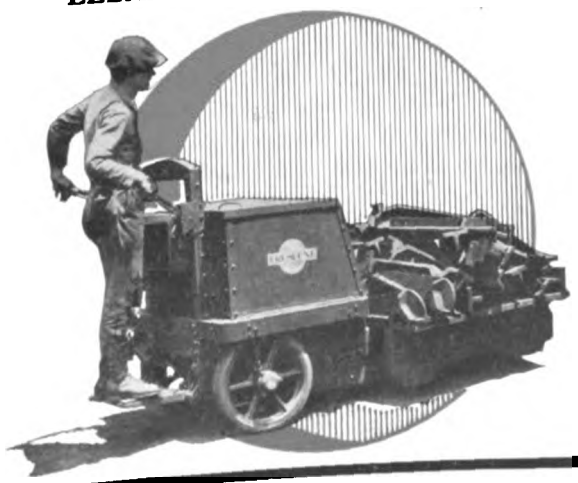
LOOK upon your transportation system as business-like as you look upon every other manufacturing operation. How much does it cost you? How is it serving you?

Analyze every factor including upkeep and speed. Determine your cost per ton mile. Let us know the result and we will try to lower it for you.

Crescent trucks have lowered transportation costs in so many plants, that we would be quite surprised if we couldn't do it for you. A Crescent truck is so flexible, so easy in costs, so great on hauling, so sturdy, so free from repairs, that you will be surprised at its showing against any other.

Why Not Drop Us a Line?

CRESCENT TRUCK CO.
165 North 10th St.
LEBANON PENNA.



Oxy-Acetylene Cutting Process Improves Foundry Methods

VISITORS to steel foundries are invariably much interested in the cutting of heavy risers. The whole procedure, from the time the casting is shaken out until the riser rolls off into the sand, will impress anyone who is a stranger to the business. The ease with which the average foundry equipment handles material is surprising; but the cutting of risers by the oxy-acetylene blowpipe is by far the most spectacular.

It is a common occurrence for the outsider to put the question, "How did you do that before you had cutting blowpipes?" This is a natural question. Not many years ago there were no cutting blowpipes. Frequently, the reply to the question dwells on the difficulties of the old methods: the hours taken to do what now requires minutes, the risk of spoiling expensive castings, and the much greater amount of grinding and other machine work required to finish the job.



A Steam Turbine Cylinder Casting, on which the risers vary from 12 to 20 inches in thickness. A machine-cutting blowpipe saves time and money in removing them.

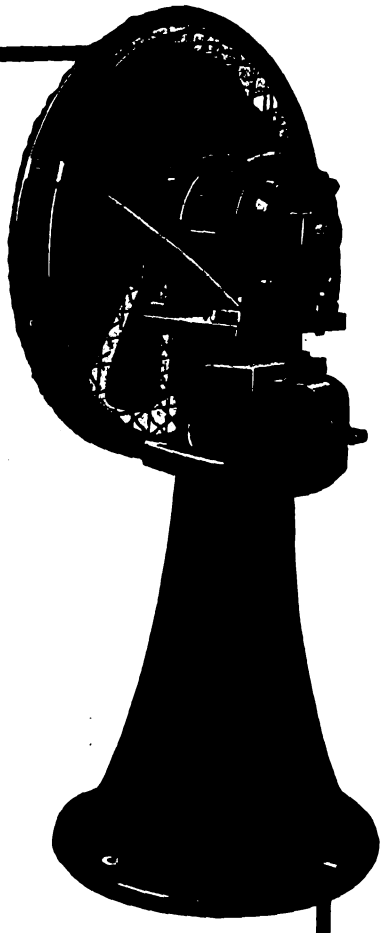
As a matter of fact, the advantage of oxy-acetylene cutting does not rest entirely with the ease and economy with which gates and risers can be removed. It has enabled the progressive foundrymen to be entirely independent of former limitations as to size and location of these risers.

It is generally well known that certain places on each particular casting or design should be fed by a generous pool of molten metal. This ideal was all too often compromised, simply because it was next to impossible to remove the risers from the inaccessible places where they were needed most. This is now all changed. The cutting blowpipe reaches any portion of the casting with equal facility. Knowing this, it has been possible to redesign entirely the gating of troublesome castings, along logical lines, with the result that defectives are now few and far between. Thus many plants in this country are today making castings of sizes and types which it would have been impossible to produce before the advent of the oxy-acetylene cutting blowpipe.

They have not only enlarged their range of produc-

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Your Men Need a "Buffalo" BREEZO COOLER



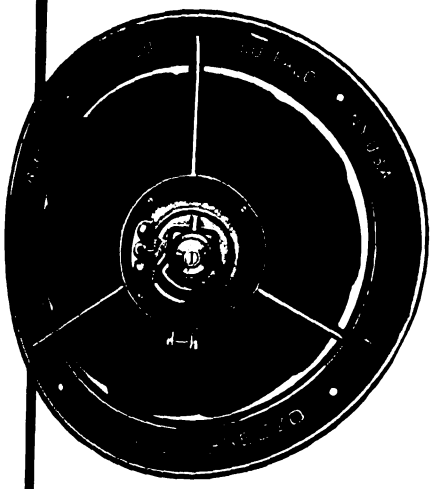
Good Management Demands It

Sweltering heat puts a tax on the men's strength and vitality. There is no doubt that production is retarded by excessive heat.

Put a Buffalo "Breezo" to work and see the difference. You need one in the furnace room, foundry, drop forge shop, wire mill and other places where the heat is oppressive even under ordinary conditions.

The cooling blast from a "Breezo" is not only beneficial, but its design shows the Buffalo experience of over forty years of fan manufacturing. Wheels are of the multiblade type; every square inch of the blade delivering the maximum amount of air—directly forward. There is a much greater range of air with a "Breezo" than with an ordinary cooling fan.

Right NOW Is the Time to Order



Don't wait any longer, send in your order now. We can make prompt shipment from stock at a price surprisingly low. Make your shop a comfortable place to work and you'll find it pays in dollars and cents—more work accomplished, less labor turnover.

Also—the New Buffalo Breezo Ventilating Fans

They are made in 4 sizes: 12, 18, 24 and 30", with direct motor drive as shown.

Larger sizes are provided for pulley drive.

The new Buffalo Breezo Propeller Fans are made with the same type of silent, highly efficient wheel as used in the "Breezo Cooler."

Buffalo Breezo Ventilating Fans are used for exhausting foul air, gases, vapors, odors, heat, moisture, smoke, steam, fumes and dust in factories, garages, theatres, hotels, kitchens, chemical plants, laundries, printing shops, and many other places. If you have a "ventilating problem," write us for full particulars about these wonderful fans.

Buffalo Forge Company
440 Broadway, Buffalo, N. Y.

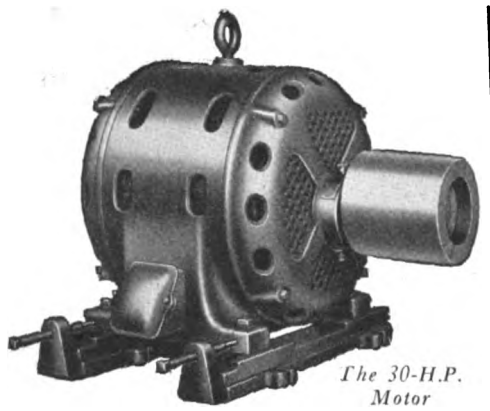
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The 30-H.P. Motor

Heavy Starting Torque

Century Automatic Start Induction Polyphase Motors develop a heavy starting torque. They are especially desirable for the operation of refrigerating machines, plunger pumps, compressors, conveyors, extractors, crushers, mixers, high speed machinery and similar apparatus.

They have low starting current characteristics—starting current does not exceed 245% of full load current. The advantages of this feature are many:—Any standard approved single throw switch may be used for starting, thus making the motor particularly adaptable to automatic or remote control. Skilled attendants, special manual control, compensators or other current-limiting devices are unnecessary.

Regular operating fuses are in most cases large enough to effect a start. In the few isolated cases where slightly heavier fuses are necessary, they are always small enough to give the motor ample overload protection.

Send for Bulletin No. 28

Built in all standard sizes from ½ to 60 horse power—temperature rise not more than 40° Centigrade. Bulletin No. 28 clearly outlines the reason for Century Automatic Start Induction Polyphase Motors superiority. Send for your copy.

CENTURY ELECTRIC CO.

1806 Pine Street **St. Louis, Mo.**

29 Stock Points in the United States and More than 50 Outside Thereof

½ to 60 H.P. **Century MOTORS** ½ to 60 H.P.

tion; but have increased efficiency and reduced production cost of even their former run of work. A case in point is furnished by the plant which produced the work illustrated in this article.

Most of the heavy cutting done at this foundry consists in removing risers ranging in size from 8 or 10 inches up to 20 inches. The steam turbine cylinder casting illustrated, is an example. In this work the risers vary in thickness from 12 to 20 inches. One man with a blowpipe working along on such a casting could probably have cut these risers within a reasonable time; but the management realized that such work was not a one-man job. They have studied the problem and concluded that additional money spent on labor and equipment would be returned in the final finishing. A machine cutting blowpipe with a straight line machine as accessory is now employed, operated by three men: a cutter and two helpers. One helper maintains proper gas supplies and pressures and the other assists in holding the cut to the proper line. Cuts made in this way are very smooth, close to the line, and require a minimum of time for final finishing.

A more fundamental development at this plant is in the design of their larger molds. The huge marine gear shown, which weighed forty thousand pounds rough cast, is an excellent example.

The risers do not take the customary shape, of stems with projecting heads, but form an almost continuous ring about the top of the casting. The six segments are separated only by a narrow space. Good quality steel for the face of the gear, where clear, clean steel is most needed, is supplied at every point by a generous pool of hot metal just above. The improvement in the quality of the work is natural. But this method of pouring could be adopted only because of full confidence in the ability of the oxy-acetylene process to cut the risers smoothly and economically.

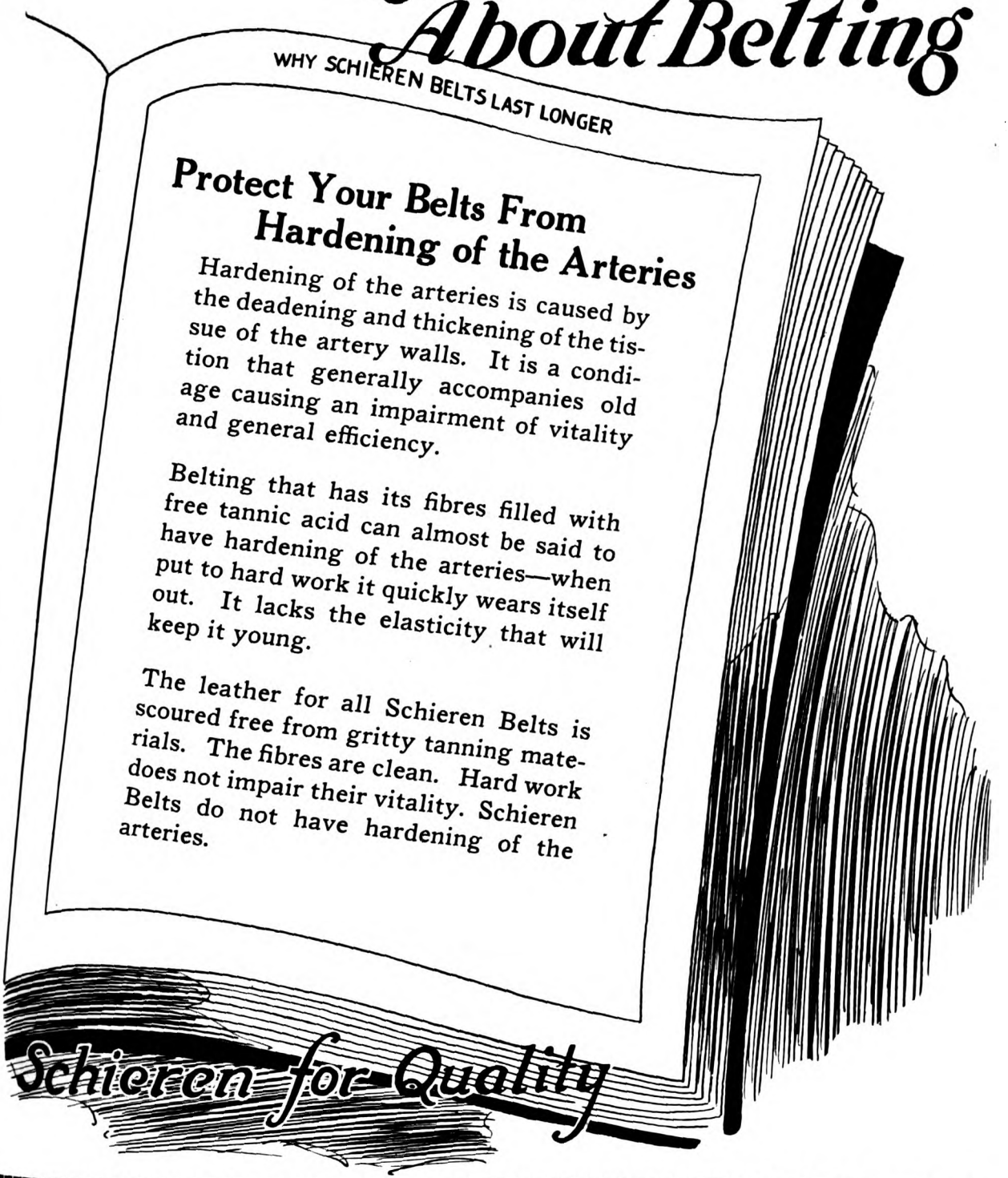
Such results clearly illustrate that foundries can increase the scope of their production by thorough study of the possibilities of the oxy-acetylene process and at the same time better the quality of their steel castings while operating at a lower net cost.

SEVERAL factors have been responsible for the drastic decline in the price of wool since the beginning of the year. First, consumption in the United States during the first quarter was disappointing. Woolen manufacturers, who take about 80 per cent. of the wool consumed in this country, used only 144 million pounds during the first three months this year as compared with 152 million pounds for the same period last year, and 1924 was not a year of heavy consumption. For the entire year only 538 million pounds were consumed as compared with 642 million pounds in 1923.

A second bearish factor has been the tendency for stocks to accumulate in foreign producing countries not only because of a smaller demand on the part of the United States but also because of a larger world production.—*Alexander Hamilton Institute.*

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Quality Facts About Belting



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Belt
Manufacturers

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Gentlemen: Kindly send me, without obligation, your series of "Quality Facts About Belting."

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—*can you cut it down?*

Let's be definite. Suppose, for example, you had 100 persons each spending 15 minutes a day making records of time at the average rate of 30c. per hour. For the year, that totals $2,250 —and the results are largely guesswork! A Calculagraph properly installed *will save two-thirds* of that time, or $1,500!

Install a Calculagraph and you'll always be glad you did it. Calculagraph prints the exact total of the time elapsed, and also records the beginning and end of each job. Our booklet, "Elapsed Time Records," contains interesting data on timekeeping problems. Free on request.

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54 Church Street **New York City**

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The Elapsed Time Recorder

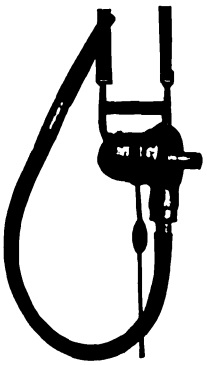
General Cleaning of Record Vaults, Stock Bins and Machinery



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Ball Bearing

Blow-er-Clean



Price $40 net complete with Blower and suction attachments.

This is the greatest all around cleaning device for dozens of jobs in any industrial plant.

It operates as a blower or a suction machine for removing coal dust, dirt and other accumulations from electrical machinery, machines and other equipment.

Write for full particulars and special trial offer.

The Martindale Electric Co.

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BLOW-ER-CLEAN

It Blows or Cleans

HOW AND WHY

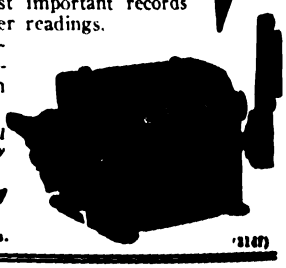
The Cleveland Metal Stamping Co. Use The Productimeter

"Our Productimeters are indispensable because they furnish the information on which we compute the amount of money due to our operators on a piece-work basis. To avoid friction and disputes with our workers, it is necessary to have an accurate, reliable account of their production upon which to calculate the amount due them, and this is furnished by the Productimeters.

"Each morning, or at the beginning of each special job, the Productimeter is set at zero, and each piece produced by the machine is automatically recorded. At the end of the day or the job, the Productimeter is read and the quantity of production is recorded on the operator's time card without any loss of time or any question as to the accuracy of the count.

"The time card is turned in to the office, where the amount earned by the operator is calculated from the Productimeter record and the labor cost is charged against the job. Thus our most important records are based upon our Productimeter readings.

"We know that our Productimeters' records are reliable because we made a test on them covering a period of a year."



New Catalog No. 46 is ready. Tell your secretary to ask for one today and have it ready in your files.

DURANT Manufacturing Company

608 Buffum St. Milwaukee, Wis.

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He Missed Two Wonderful Opportunities but Seized the Third

By Dwight G. Baird

IF ever a man had a hard time finding himself, if ever a man had good reason for believing that the fates were against him, and if ever a man pressed forward in the face of reverses without doubting that he eventually would win, Harry M. Jewett would seem to be that man.

On taking his degree in civil engineering in 1890, Mr. Jewett secured a job as a stake driver for a corps of engineers who were then making the preliminary survey for the Chicago drainage canal.

Shortly afterward, he accepted a similar position with Michigan Central Railroad so he could be in Detroit. His salary was $50 a month.

Before he had been with the M. C. a year, Jewett's big opportunity came. The road had been constructing a drainage sewer from the stock yards to the River Rouge, quicksand had been encountered, and the contractor had failed. The road had to take over the job and Jewett was placed in charge.

Jewett succeeded in putting through the drain at less cost than that specified in the original contract.

Jewett was hailed as a great engineer, a man who would rise high in his profession, and the company offered him what it considered a suitable reward—a salary of $145 a month and the title of assistant divisional engineer.



Harry M. Jewett, president of the Paige-Detroit Motor Car Company.

Then Jewett quit. He had been doing a lot of thinking about his future and he had reached the conclusion that opportunity in the engineering profession was entirely too limited to suit him. His chief was astounded, but when young Jewett explained why he was quitting, his astonishment changed to tolerance. The lad evidently had "the big head."

"You are the chief," Jewett said, in effect, "and you are getting only $6,000 a year. I might never get that much, but if I did, it would be the absolute limit. I don't care to spend any more time in a profession in which $6,000 a year is the limit. I may never make more at anything else, but I'm at least going to try."

He went out and got a job selling advertising space for the Detroit News. Selling advertising space was not a very lucrative job, however, so he decided next to sell coal.

Jewett went to work in the coal mines for $75 a month. There his training as a civil engineer came in handy and he was soon offered the superintendency of the mine, but this he declined, preferring to pursue his original purpose of becoming a coal salesman.

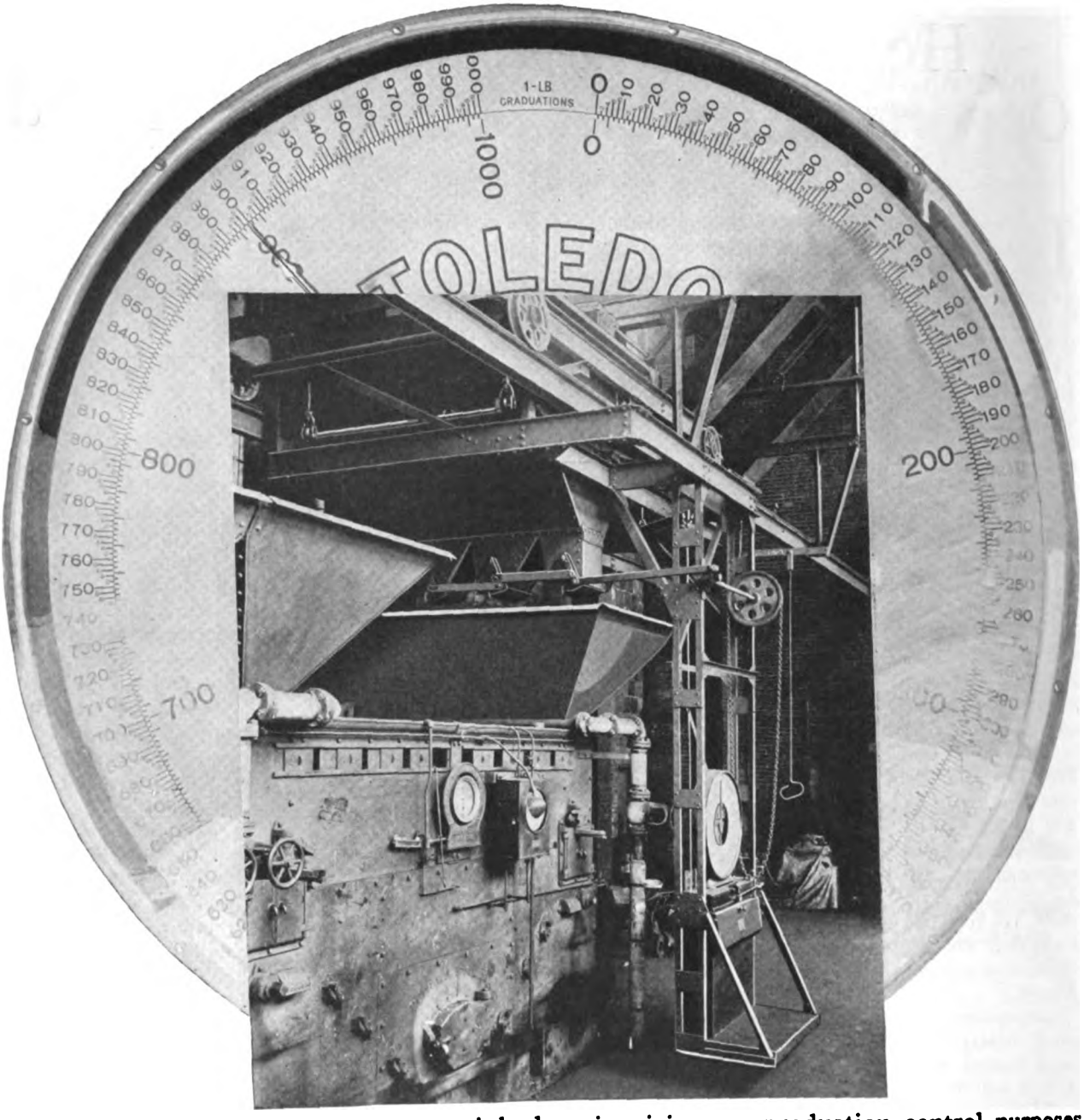
After "graduating" from the mines, he went out as a coal salesman just in time to meet the panic of 1894.

Then, when he began to get some big orders and the future took on a brighter aspect, the miners went on strike and his operator had no coal for him. Undaunted, Jewett went to the non-union mines of West Virginia and contracted for the first West Virginia coal ever shipped into Michigan, becoming an operator himself.

In connection with his coal operations, Jewett made frequent trips to West Virginia and soon became interested in the undeveloped mineral lands of that state. With a pack on his back in true prospector fashion, he spent many weeks tramping over the mountains and buying options on promising properties.

Then came the Spanish-American War, and Jewett went along with Edwin Denby, Truman Newberry and others in the Michigan Naval Reserve. Meantime the options expired.

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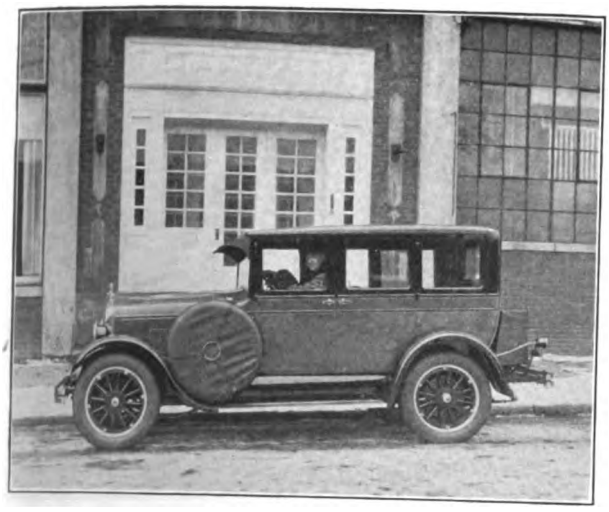
WHEREVER materials are weighed or measured there is a profit saved or lost. At the receiving dock, in transfers between departments, in the shipping room, in the boiler room—wherever the measurement of materials is necessary for auditing, invoicing, or production control purposes, there are gateways through which profit enters or leaves. And the first requisite to the safeguarding of profit in any measurement operation is the automatic and dependable accuracy of a Toledo Scale.

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At the wheel of his new Jewett DeLuxe Sedan.

The properties on which these options were held are now estimated to be worth $500,000,000.

Back from the war, Jewett formed with two others the coal brokerage business of Jewett, Bigelow and Brooks and for a number of years did a large wholesale and retail coal business. Then they decided to sell out their retail holdings and Jewett sold a coal yard to H. M. Malcomson for $25,000, accepting a down payment of one-half the amount and a note for the remainder.

Malcomson at that time was one of the principal stockholders of the Ford Motor Company and when the note came due, he offered Jewett what is said to have been one-fourth of the outstanding stock of this young automobile manufacturing company in lieu of the $12,500.

Jewett was inclined to accept, but he had been trained to consult his banker before engaging in any major business deal, so he went to his banker and asked what he thought of Malcomson's proposition. The banker did not think at all well of it. The automobile would never be anything more than a rich man's toy, production was already at the saturation point, this fellow Ford was a "nut," and so on.

Jewett declined to accept an offer of one-fourth of the stock of the Ford Motor Company in payment of a $12,500 note!

President of Paige Co.

In 1910 Mr. Jewett resigned as head of the firm of Jewett, Bigelow and Brooks and pitched in to salvage the Paige-Detroit Motor Car Company. The first thing he did was close down the plant. Then he scrapped just about everything about the place, including the car and over $250,000 worth of faulty and obsolete materials, and began work on a new four-cylinder engine. The stockholders were called upon to put up an additional $25,000, creditors were prevailed upon to be lenient, and things began to hum.

The fifteen years that have elapsed since the reorganization of the company have been years of continuous growth and prosperity. In 1909, Paige produced 302 cars; in 1923 the company produced 43,556 cars. The schedule for 1925 calls for a still higher output.

Making industries load lighter



—and safeguarding men at the same time

Lightening the load obviously makes for saving all along the line, although in no instance is the saving as many sided as in the case of materials and products moved by hand. Even if handling of this character forms but a fractional part of the day's routine, it is certain that wherever a man and a pair of hands are involved, anything that will minimize physical strain and speed the operation will likewise decrease the possibility of accident, and increase productivity.



Each year more companies look to us for the logical solution to this important problem.

Realizing that—

An investment in man protection pays dividends in increased production and fewer costly accidents—

these manufacturers are determined to have the right kind of man protection.



And that leads to a very important point: a worker wearing makeshift gloves, leggings, or other uncertain apparel is only half protected, if it may be said that he is protected at all.

Painstaking test and wide usage have proved that the logical glove for the industrial worker is the STEEL GRIP GLOVE.

It is not so much that a glove be used as that it is the right glove!



This glove was scientifically designed to meet the demands of numerous safety engineers and plant owners. It is made of chrome tanned leather, and sewed with steel. The surface of palm, fingers and thumb is reinforced with small ribbons of steel clinched through the leather by a special process which makes it impossible for them to loosen or hurt the hand.

It is available in many styles to serve the needs of foundries, ship yards, smelters, glass works, forges, automobile plants, refractories, scrap yards, refineries, etc. The coupon makes it possible to secure the full story of Steel Grip Gloves, Hand Pads, Mittens, and Arm Protectors, as well as Industrial Leggings, Aprons, Spats and Suits.

These companies know the value of man protection. Each company has used our products for five years or more: International Harvester Co., American Steel Foundries, Crane Co., National Cash Register Co., Otis Elevator Co., Timken-Detroit Axle Co., and Willys Overland Co. (a partial list).

Industrial Gloves Corp.

Gloves, Leggings, Suits — Arm Protectors — Aprons, etc.

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"The protected man is the productive man"

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Send me a copy of your booklet, "Safeguarding Industry's Greatest Asset: Man."

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Glare!

NOW ELIMINATED

With 94% Light Intensity Maintained

(*At a Fraction of Cost of Shades*)

Send Now for Liberal FREE Sample

WILL you let us prove to you that it is easy and economical to eliminate glare and reduce heat 10° to 15° with *Skyco No-Glare?*

We don't ask you to risk a penny. We simply ask you to try out the free sample we send you. There is no obligation. Just write us for a free sample of *Skyco No-Glare*. When it arrives either spray or brush it on the glass, either outside or inside. Have the glass clean. Dirty glass only aggravates glare and cuts down the light.

Then Note Results

See how *Skyco No-Glare* modifies daylight to a cool, restful, full light. By actual thermometer tests note how heat is reduced 10° to 15°. Mark that rain or weather conditions cannot affect *Skyco No-Glare;* that it does not flake or rub off yet can easily be removed with warm water and brush.

Send for Free Sample Now

Glary, hot days are here and your windows need *Skyco No-Glare*. We don't ask you to risk a penny or obligate yourself in any way. Just write for generous FREE sample and then determine from results if you can afford to be without *Skyco No-Glare*.

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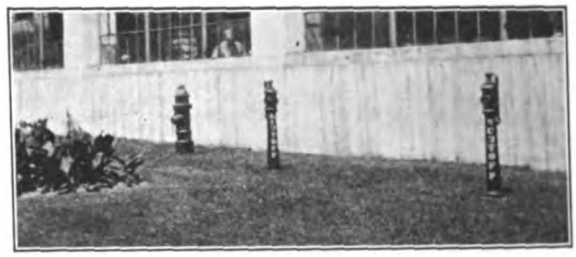
Chicago Office, Tower Bldg., 6 No. Michigan Ave.

SKYCO NoGlare

Testing the Fire-Fighting Water Supply

By H. A. Donald

IN the vast automobile shops of Detroit, the item of fire insurance runs into seven figures very easily. To keep insurance premiums at the lowest point, while affording greatest protection against loss of production through fire, the plants are equipped with roof tanks, private pumping plants, sprinkler systems, etc., in addition to the city water. There are pumping engines in some plants as powerful as those serving whole cities elsewhere, and the discharge from these may be by-passed into sections of the city mains nearby, should extra pressure be needed in some part of the plant several blocks away.





Above are three sentinels for testing purposes, outside the plant. At the right, a hydrant made ready for testing; while below is shown a test under way.

But even these super-facilities must submit to regular inspections or surprise tests in order to be sure that there are no maladjustments, no inoperative units that would prevent the system from delivering its maximum rated capacity at the short notice inseparable from fire needs.

The accompanying photos show different phases of these inspections—two of them at a motor car plant and one at a leading body factory. The one view shows three sentinels conveniently placed outside one of the shops, these being duplicated every hundred feet. The cut-off valves serving the sprinkler system and the hydrants undergo an operative test to determine their working condition, even though no water is put on.

Another view shows a double hydrant made ready for testing. A gate valve is coupled up to one of the outlets. This valve has the NBFU thread for hose couplings at each end and its use enables a hose line to be shut off while leaving the hydrant open to get a static pressure reading at the hydrant.



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Now! during the hot weather



LABORATORY tests show that for Man-Kooling use the largest quantity of air with the least power is delivered by a four blade wheel—in other words, the Robinson Four Blade Wheel is the most efficient. Conclusive proof of this statement is found in aeroplane propeller design.

Compare This Robinson Man-Kooling Fan In Your Shop

EXAMINE a Robinson Man-Kooling Fan closely. Note its sturdy construction, its flexibility, its one piece ROBINSON *patented* aluminum alloy wheel, the special enclosed thrust bearing, and the compactness of the entire unit.

Then start it and feel the even cooling current of air which it propels uni-direction so uniformly. Compare it with any other make—test it in your own shop. We know that the engineering skill embodied in the construction of this fan is superior. We want *you* to know it so we are extending this special FREE offer for the Summer months:

We will gladly send ROBINSON Man-Kooling Fans for comparative test in your own shop. No obligation on your part—immediate shipment by FREIGHT or EXPRESS from Pittsburgh stock.

In ordering state size (24″-36″-42″), voltage, phase and cycle.

Robinson Ventilating Co.
House Building Pittsburgh, Pa.

Manufacturers of Ventilating Equipment, Waste Heat, Steel Plate, Forced and Induced Draft Fans, Man-Kooling Fans.

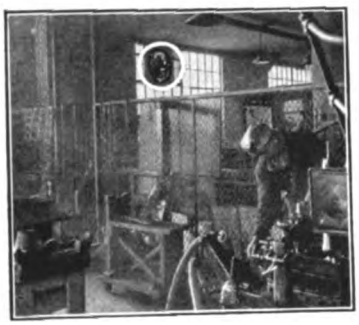
ROBINSON MAN-KOOLING FANS

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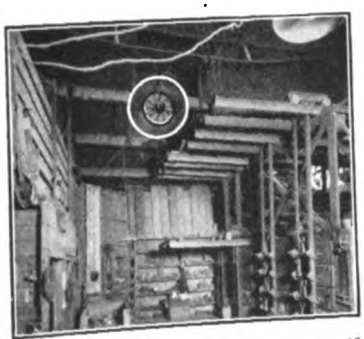
Remove Dangerous Fumes and Foul, Impure Air!



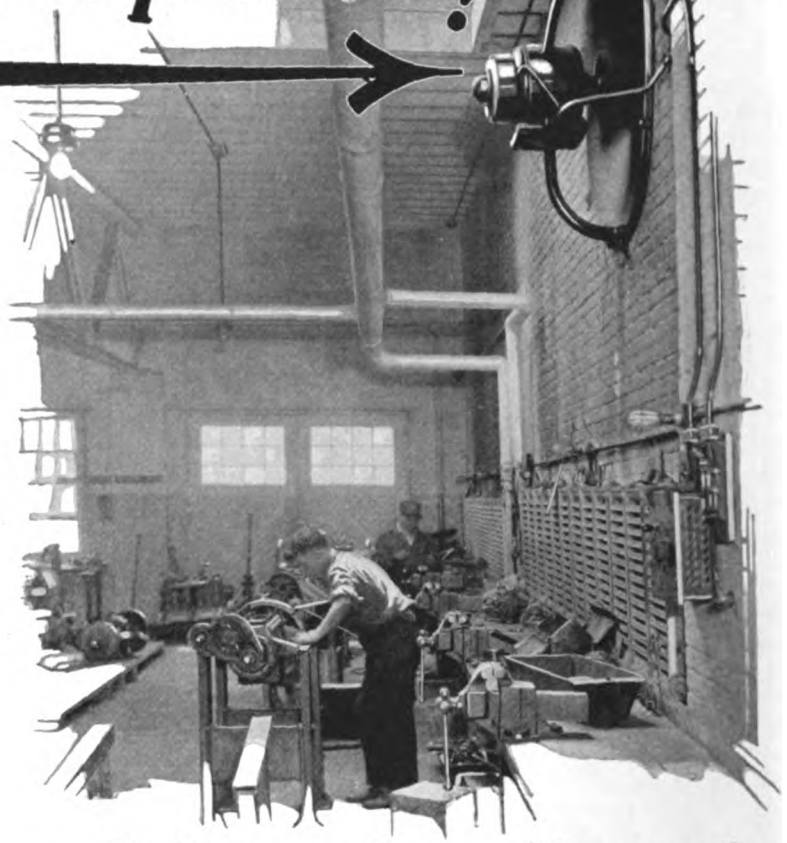
Ventura Fans will remove the poisonous gases from the laboratory or shop.



Poisonous gases that are found in all garages can be eliminated easily and quickly with American Blower Ventura Fans.



Men could not work in this core room if it were not for the American Blower Ventura Fan.



—with Ventura Fans without costly alterations or cumbersome equipment and at trifling cost

American Blower Ventura Fans for the removal of heat, gases and fumes are the most efficient disc fans on the market. They can be installed easily and quickly in any room or building having outside walls, windows or transoms. By removing dangerous fumes and foul, impure air Ventura Fans become important aids in increasing production and decreasing labor turnover.

If you have excessive heat conditions in your shop or factory, or are troubled with vapors, smoke, steam, fumes or poisonous gases, our engineers will gladly show you how easily and cheaply Ventura Fans will solve your difficulties.

Ventura Fans are carried in stock for immediate delivery in all sections of the country.

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Saving Labor and Costs in Railroad Terminal Freight Handling

By F. C. Eibell

AT one of the busiest and oldest freight classification points in the Chicago territory some interesting records are available which permit us to go back quite a few years in our endeavor to compare the past and present methods of freight handling.

At this terminal all outbound freight is handled, and a total of 84 cars can be put through here daily on the seven sets of tracks between the main freight shed and an adjoining platform. The shed is 600 feet long and 30 feet wide, and the platform is 800 feet long and 20 feet wide.

Ten years ago this terminal was operating on what was termed "day-work." This means that the handling of all freight was done during the day, no night shifts being employed. At that time, a total of 19 gangs of 7 men each, or 133 laborers, were necessary to handle an average daily tonnage of 600 tons. All material was moved by hand trucks, and only a small amount of freight per gang of men could be handled by this method. The work was hard, and it was difficult to keep men on the job for any length of time. As many as 12 men would labor strenuously in attempting to push a large machine into a freight car over a distance of 400 feet, and the time required would average 45 minutes. Contrast such back-breaking and time-consuming methods with the present-day method of handling a large machine through the use of a small three-wheel tractor and one man, the same distance in the short time of eight minutes. Even though the cost of labor was very low at that time (10 years ago), about $1.70 per day per man, so many men were required that the cost of handling a ton of freight averaged about $1.50. The men were working ten hours daily on a straight salary basis and it was impossible for the employer to better the wage unless one might prove capable of being assigned to the position



Fig. 1. Contrast the load handled by each or all of these men (below) with the effortless method shown in the other illustrations on this page.

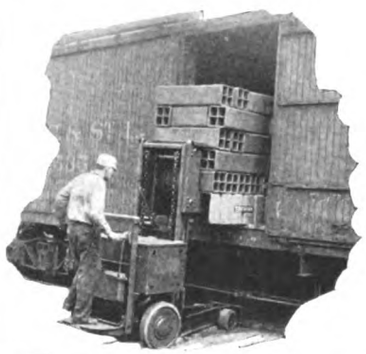


Fig. 2. The elevating platform truck deposits its loaded skid right on the box car floor, without requiring any manual lifting.





Fig. 4. Twenty-one men handle 84 railway cars of freight daily, as against 49 men required under the old method.

Fig. 3. Despite an increase in labor costs of from $1.70 per man per day ten years ago, to $5.00 per man today, the per ton cost of handling freight at this terminal has been reduced from $1.50 to 70 cents.

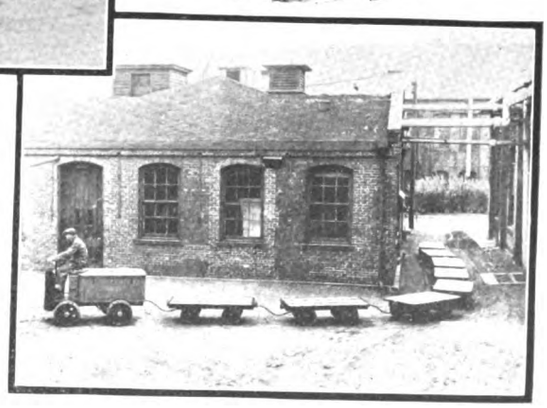


Fig. 5. Note how a trailer train actually trails in the path of the tractor.

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ROLL EASY
AND
LAST LONG

ASK
THE USER—WHO KNOWS
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WHEELS

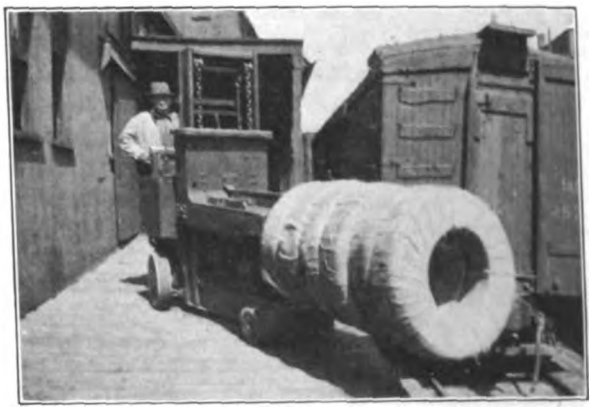


Fig. 6. The elevating platform truck need not be merely at platform; it can be adapted to a variety of uses.

of checker, which consisted of checking and weighing every piece of freight placed in a car.

Late in 1915, a system of handling freight on piece work basis was inaugurated, and through this method a very low cost per ton charge was effected. Gangs were reduced to three men each and only seventeen gangs were required to handle the daily tonnage, over a ten-hour period. Under this piece-work arrangement, a man not only received a straight salary, but in addition was compensated for the amount of freight handled by his gang. To aid in making this method a success, two flat platform trucks were installed, and trucking was reduced about 80 per cent., with a considerable reduction in the handling cost per ton.

In 1921, a general slump in business affected this terminal, as well as others, and the number of gangs were reduced from seventeen of three men each to seven of three men each. Since that time, spurts in business have necessitated putting on extra gangs, but the piece-work system is so efficient, that, at the present time, the seven gangs are handling an average daily tonnage of 350 to 400 tons of material over an *eight* hour day.

It was recently decided that it would be more advantageous to use a three-wheel tractor in place of the flat platform trucks, and the tractor is now doing the work of the two flat platform trucks. This has further reduced the per ton cost, as well as the operating expense, which includes depreciation of one machine, charging maintenance of the three-wheel electric tractor, including salaries of men in gangs. The remarkable low cost of 70c per ton for handling has been brought about.

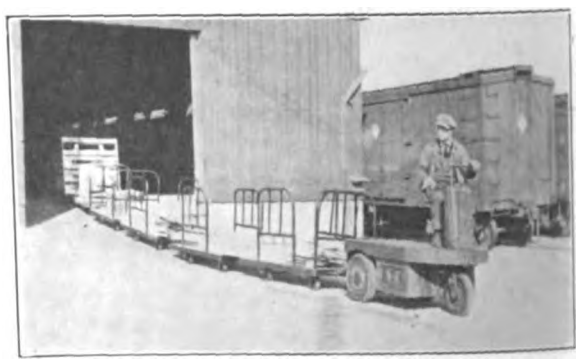


Fig. 7. The tractor train coming out of the freight shed with a miscellaneous load of sheet steel, rods, and cased machinery.

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is yours for the asking —just mail the coupon —the postman will place it on your desk

Here's something real — it works — right before your eyes and shows why there is no overhead obstruction that can stall the work of "The Telescoper."

It shows how "The Telescoper" can work under low beams, pipes, and balconies — or pass thru low doorways and onto elevators—all without adjustment or "hinging over the top"—and in the next instant elevate its platform to work to the ceiling,

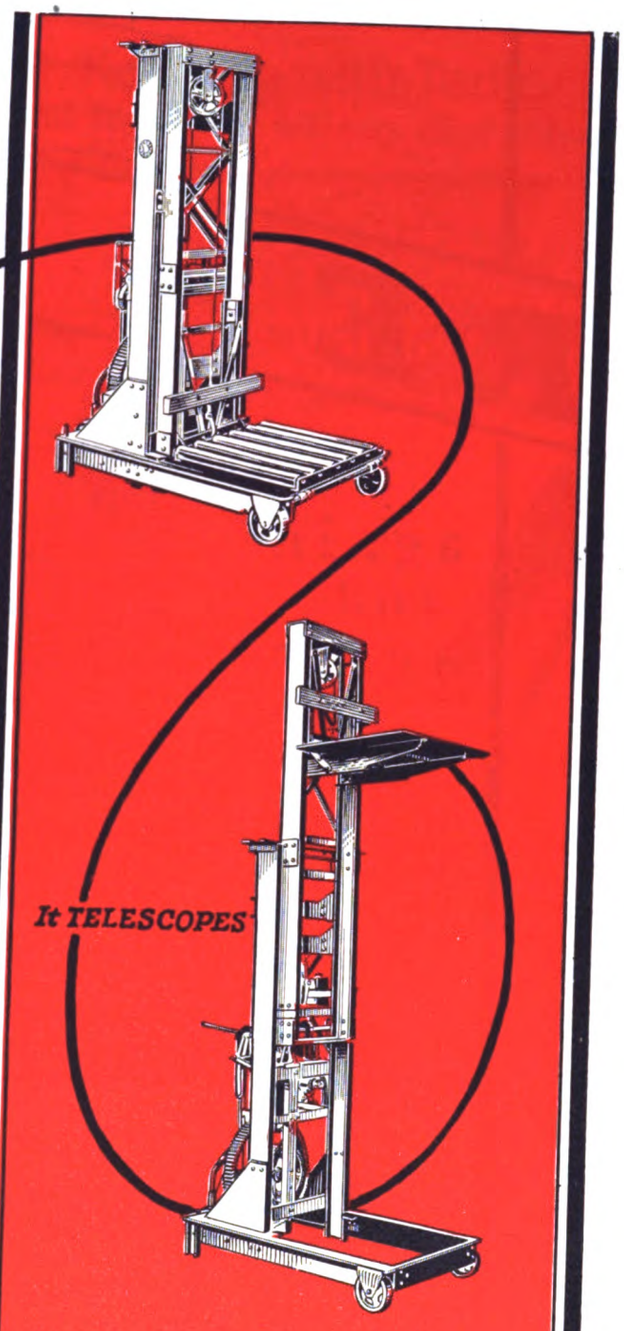
It tells a story better than Webster's whole dictionary—it doesn't cost you a nickel but its worth many dollars—for it shows how to save money.

Just clip the coupon — send it today for *your working model.*

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The Telescoper is built in many capacities, sizes and kind of power—all to suit your requirements.

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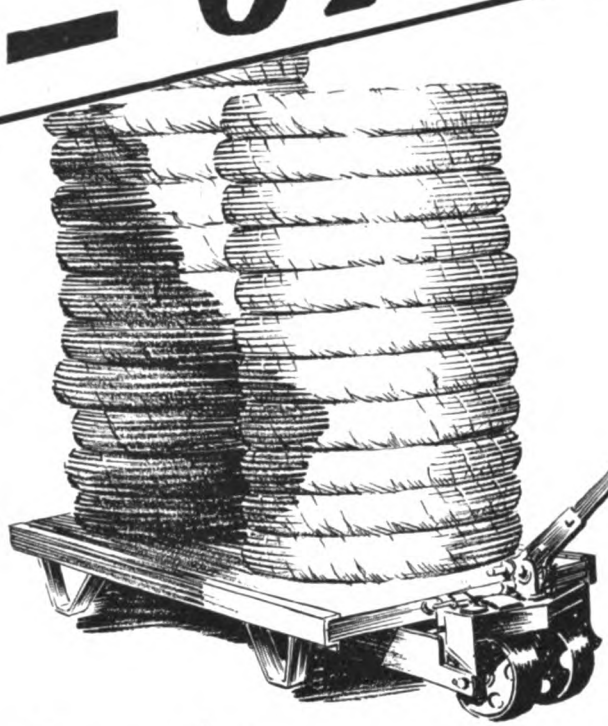
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RE-ORDER

again
and
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89 Stuebings
in the
Firestone Plant

THINK of the purchasing power of the great Firestone organization—of their ability to judge values—of their extreme conditions and severe demands—of their knowledge of costs and strict economy in purchases.

Re-ordering Stuebings again and again—89 of them—standardizing on them one hundred per cent, in spite of terrific price competition, can only indicate one thing to you. If you purchase any but Stuebing products, *somewhere*—in quality—in performance—in life and ease of operation, *you will lose.*

Put Stuebing to work in your plant now and check up. You also will find them worth re-ordering again and again as your conditions expand.

There is no obligation—no expense. Make the test now.



Stuebing Steel-Bound Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble

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CINCINNATI, OHIO

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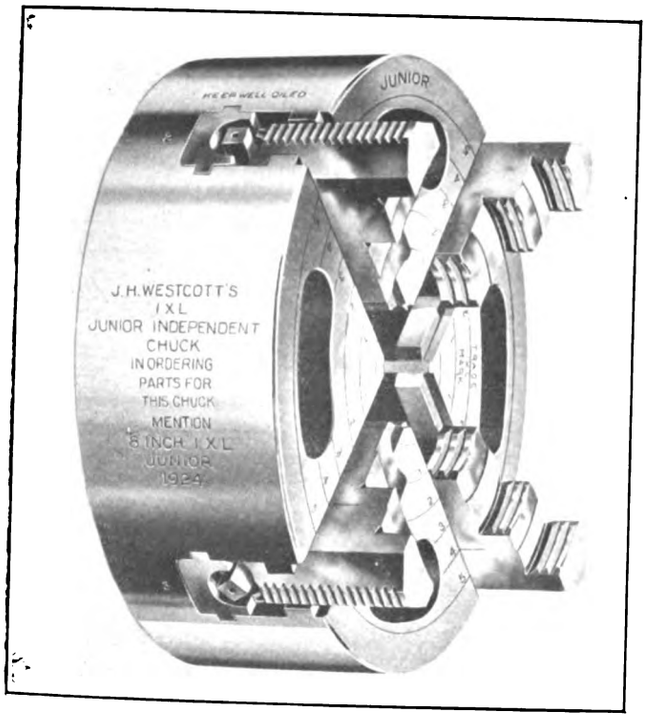
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The Junior I. X. L. Independent Lathe Chuck

THE Junior I. X. L. independent lathe chuck, illustrated herewith, has been brought out by the Westcott Chuck Co., Oneida, N. Y. It is now offered to those especially seeking a chuck for use on light lathes. It is made exactly like the company's regular I. X. L. chuck, but differs from the "parent" line only in that the body, jaws, screws, etc., are proportionately lighter weight.

The manufacturers claim that for its size this independent type chuck is unusually strong. This result has



been obtained by providing each jaw screw with a hardened steel carrier. Thus the thrust does not come on one point, but is distributed so as not to break or spring the chuck body. These screw carriers, which furnish steel thrust bearings for the screws, can be removed when they become badly worn and in this way the life and usefulness of the chuck are greatly prolonged.

The Junior I. X. L. is offered in the following sizes: 5, 6, 8, and 10 in.

THE cost of transporting coal figures largely in the aggregate of industrial costs. The railroads utilize about one-tenth of their carrying capacity in transporting the coal which they alone use, and they must transport to the point of consumption about twice as much more of bituminous coal for other uses. The substitution of electric power for the direct application of steam power points the way to the reduction of these costs. Comparative cheapness of electric energy and convenience in its use are the factors which will chiefly govern the rapidity of further progress in this field.—*The Guaranty Survey.*

Keep Up with Today
and Tomorrow will take Care of Itself



HORSES gave way to horsepower when their job became too much for them. In the same way, King Tut's artisans were supplanted, after centuries, by modern drilling machinery; and the drills—even the drills used on the horse car—have long since been relegated to the limbo of useless equipment.

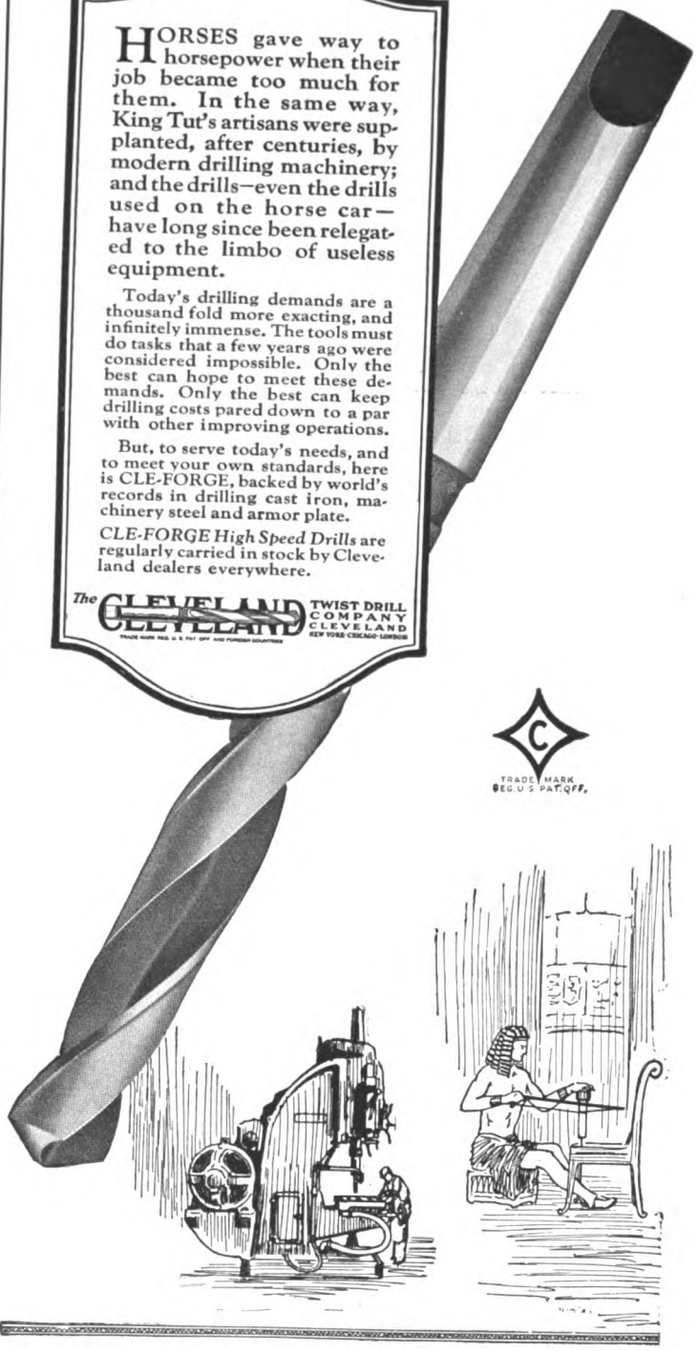
Today's drilling demands are a thousand fold more exacting, and infinitely immense. The tools must do tasks that a few years ago were considered impossible. Only the best can hope to meet these demands. Only the best can keep drilling costs pared down to a par with other improving operations.

But, to serve today's needs, and to meet your own standards, here is CLE-FORGE, backed by world's records in drilling cast iron, machinery steel and armor plate.

CLE-FORGE High Speed Drills are regularly carried in stock by Cleveland dealers everywhere.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF.



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PRECISION BEARINGS

Make Good Motors Better

You men who depend upon motors for power and production—have you ever figured what a failure of your motor bearings would cost you, in repairs and replacements and lost output?



Motors with **"Norma"** Precision Ball Bearings and **"Hoffmann"** Precision Roller Bearings free you from motor bearing troubles—most of which are due to neglect to oil the common sleeve type bearing. **"Norma-Hoffmann"** magazine lubrication protects you against this hazard.

Moreover, a **"Norma"** or **"Hoffmann"** equipped motor uses less current, starts more easily, runs more smoothly, lasts longer, pays larger dividends on its cost because it does more and costs less in doing it.



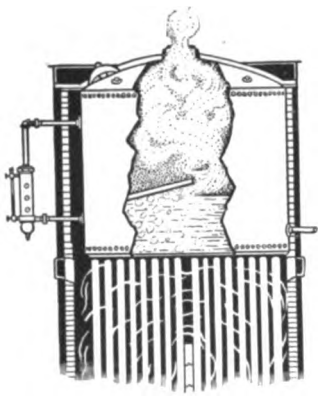
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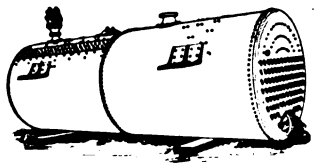
WICKES Steam Boilers

Vertical Water Tube



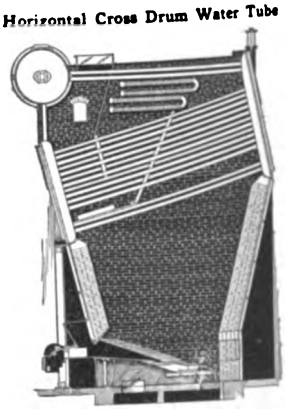
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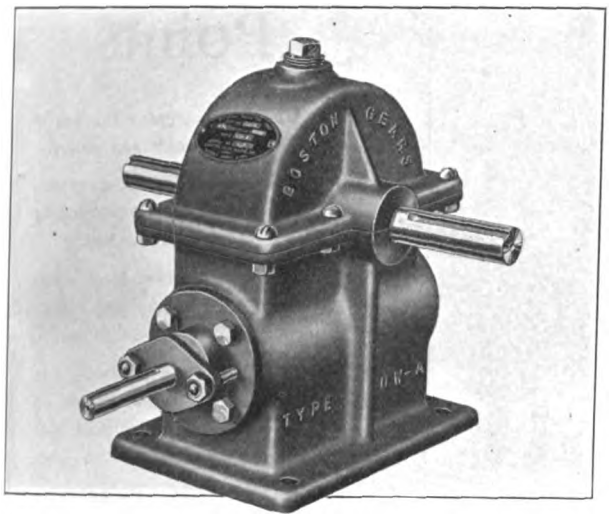
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is at a sufficient height from the base of the unit to permit a large oil reservoir.

The GUW series of Units have a range of from ¼ to 12 hp. from driven shaft at a driver shaft speed of 1,800 R.P.M.

A SURVEY of the business situation as a whole reveals the interesting and important fact that those industries which are preparing for the future are likewise those which are most in touch with the present. They have been able to sense or forecast the drift of events, and so they now prepare for changes before they happen, not afterward, when it is too late. Such is the story of the railroads, of the metal industries, of a part at least of the cotton-textiles industry, and others. But there are still some industries that are somewhat belated in their preparedness for days to come. Yet it is now quite evident that all the leaders of industry and trade are much of one mind as to what is needed.

Stability of business conditions in general—freedom from extreme and abrupt changes, hot one day, cold the next, with everybody wondering and speculating on "what next"; freedom from hazardous uncertainty so far as possible—that is the essential need of business. That we are making fast headway in this direction, there is no doubt. It is the direction in which sheer efficiency of management comes into its own.

The outstanding fact of the day—a fact of tremendous significance in the world of business, and a fact that is the main component of the widespread conservatism of the day—is the general concern of all industry and trade, not so much for the immediate present, as for forethought and action that shall lay enduring foundations for continued prosperity in the future.—*La Salle Extension University.*



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The Lenix Drive (Reg.)

reduced the pulley centers from 16 to 8 feet—

A glance at these two photographs taken before and after the relocation of the 100 K.W. alternator at a New York State Carpet Works shows the great saving in floor space.

The change was made practically overnight, as the new foundation was finished without interfering with the operation of the set.

Incidental to the improvement of the main drive, the exciter drive was also equipped with a Lenix. The exciter drive, if anything, is even more important than the main drive, and through the use of the Lenix the general efficiency and reliability of the new compact grouping of the units were greatly improved.

The Lenix is not an idler. It is a "belt wrapper" scientifically applied to belt drives for the purpose of eliminating belt slippage, saving floor space and increasing the general capacity of the drive.

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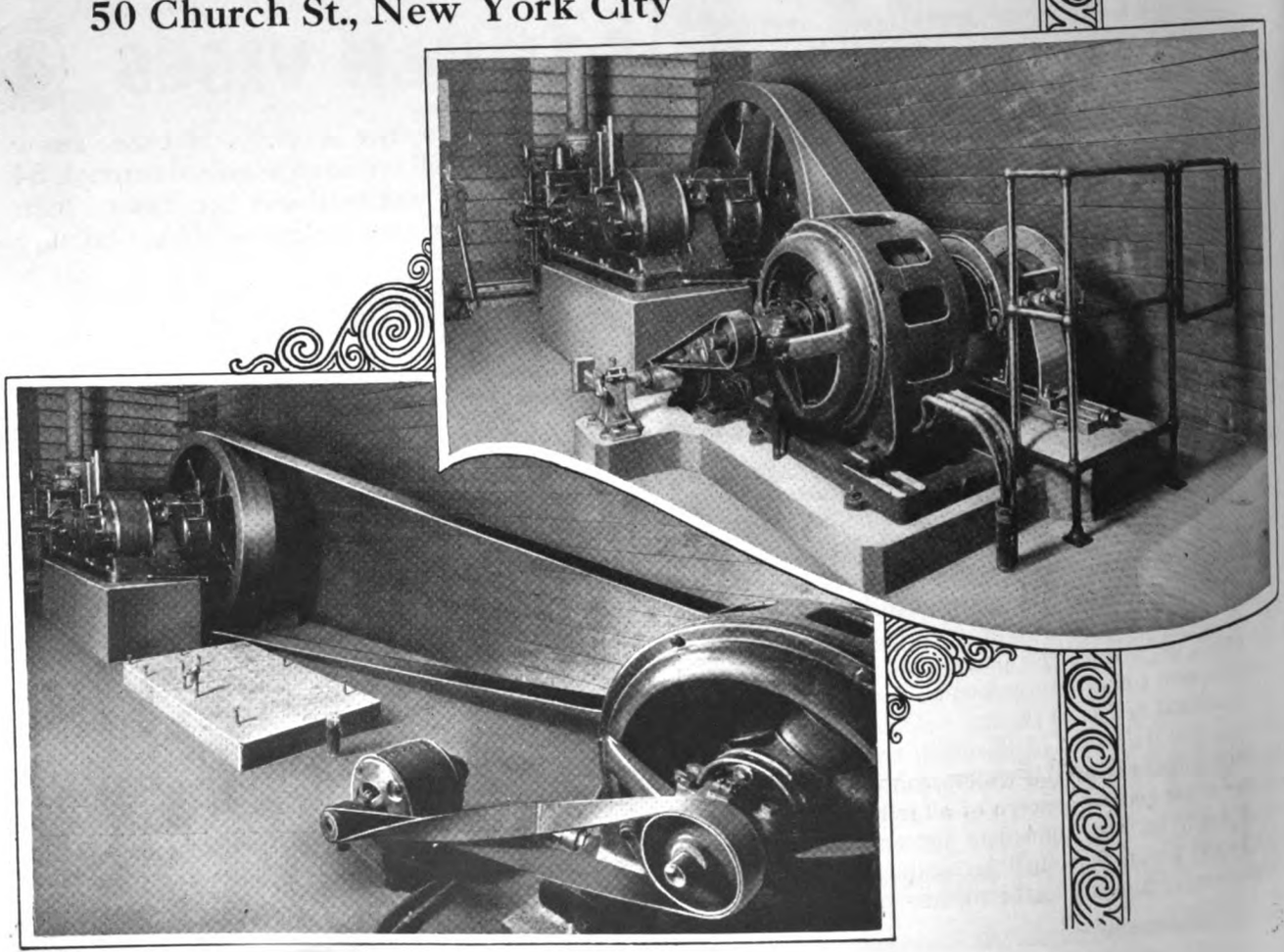
2—The LENIX maintains constantly and accurately the proper tension in the slack side of the belt.

3—The LENIX saves floor space, building space and belting because of freedom in pulley locations.

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5—The LENIX permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratio.

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The drag on the steam gauge

HAND firing of coal lays a heavy hand on steam output just at the time when more power is needed for peak production or plant expansion. When the demand for more steam comes, two courses are open:

More hand fired boilers can be installed: more bedlam in the boiler room; more waste of coal and money—*or* mechanical stokers can be installed to wipe out the whole problem.

The latter course not only replaces the confusion of hand firing with smooth running labor and fuel saving equipment, but it also provides greatly added boiler capacity that often makes the installation of additional boilers unnecessary. In this case the first cost of the stoker installation is offset by the saving in boiler equipment.

By providing for any possible steam demand, by cutting boiler room labor costs, and by burning a lower grade of coal at the highest possible efficiency, mechanical stokers will pay you a dividend that is unsurpassed by any other equipment selling at any price.

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Stoker firing will cross at least two men off the pay roll if adopted by a hand fired plant now requiring five men. The better working conditions appeal to a better, steadier class of men.

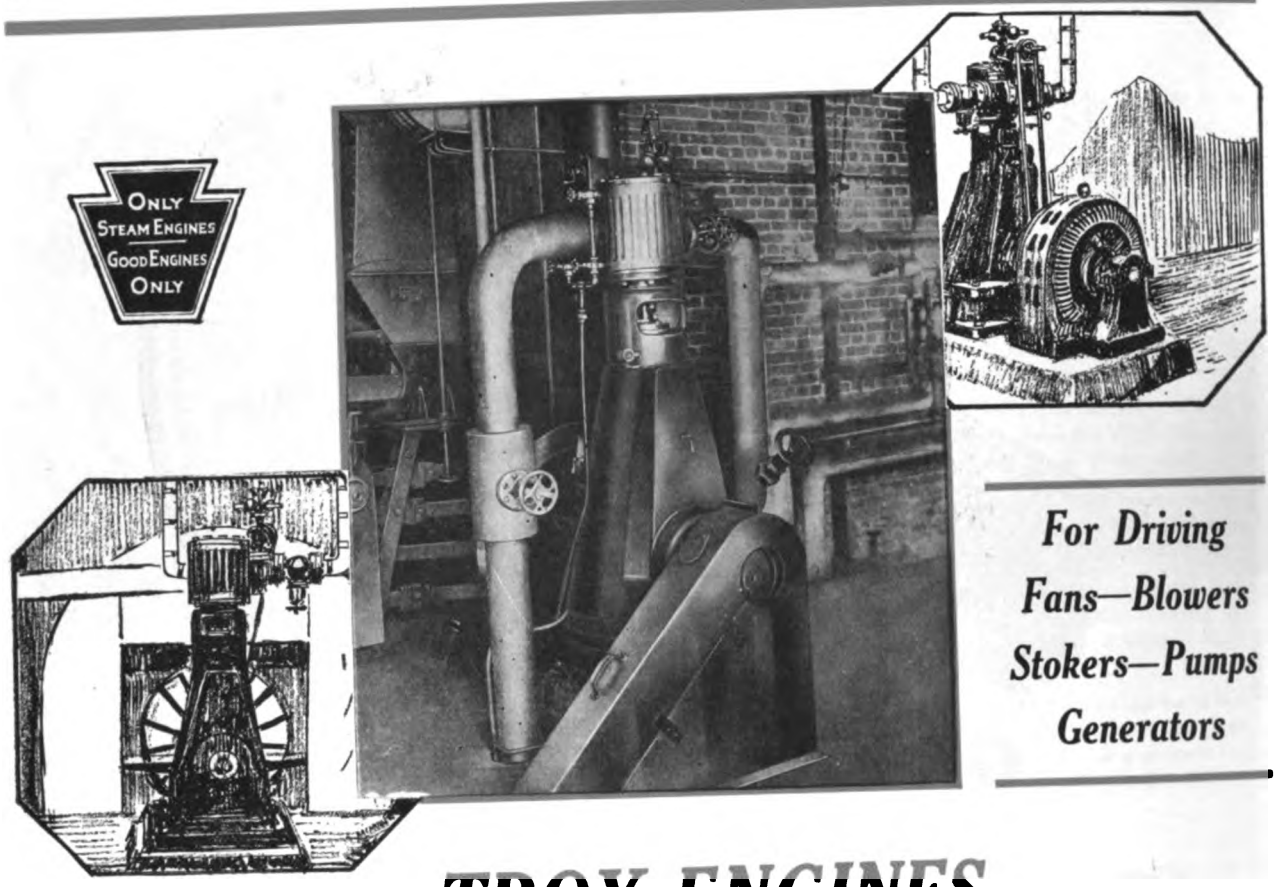
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A Town Built to Order

Kohler Village, Wisconsin

By N. S. Amstutz

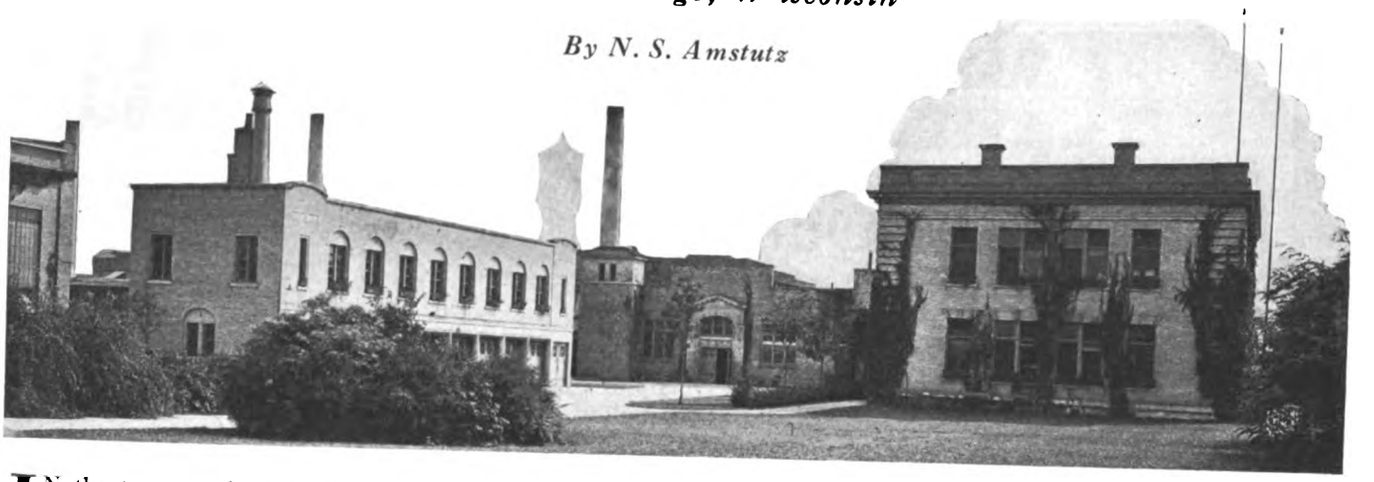


Fig. 1. A view of the present main office of the Kohler plant, in Wisconsin, to be replaced by a new Administration Building recently begun.

IN the two words, "Realized Idealism," is found a fulfillment of a vision of Mr. Walter J. Kohler. This realization is exemplified in the substantial community and industrial center happily located in the State of Wisconsin, where the name of its founder is perpetuated by Kohler Village.

The past has seen many industrial communities rise, fill a measure of activity and later succumb to an inexorable law which nullifies endeavors that do not meet the demands of reciprocative service.

Every line of wholesome social activity has been recognized in the planning of Kohler Village. No one is made to only fit into a standardized wheel as one of many cogs, but individuality of purpose, prerogative, etc., is a fixed part of the policy of the company. Through Building and Loan Association any employee can secure financial assistance to buy a lot in his own name and build a home for himself and family and thus become an integral part of the community's social and civic life.

A coördinated agency is the Kohler Improvement Company which erects houses for employee purchasers under designs prepared by able architects. The houses are sold at actual cost to members of the Kohler Company organization, which includes all employees. They are built substantially and well, and are artistic. Being constructed in groups, great economies are secured which naturally inure to the purchaser. The best plumbing, gas, electricity, and furnace heating are provided. In addition, the Improvement Company landscapes each plot of ground, plants trees, shrubs, etc., so as to have the environment of each home a part of an artistic ensemble. Monotony in buildings is avoided, so that the idea of personal individuality finds exemplification in each home.



Fig. 2. Above, a group of residences on School Street, looking Northeast. Note the individuality of the homes.



Fig. 4. The entrance to the American Club, one of a number of clubs organized by employees.



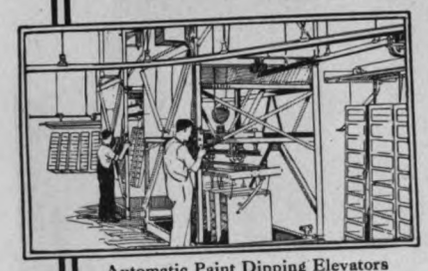
Fig. 3. Parlor of the American Club, Kohler Village.



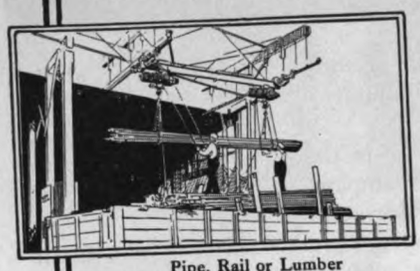
Fig. 5. A group of residences nearest the plant.

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Pipe, Rail or Lumber

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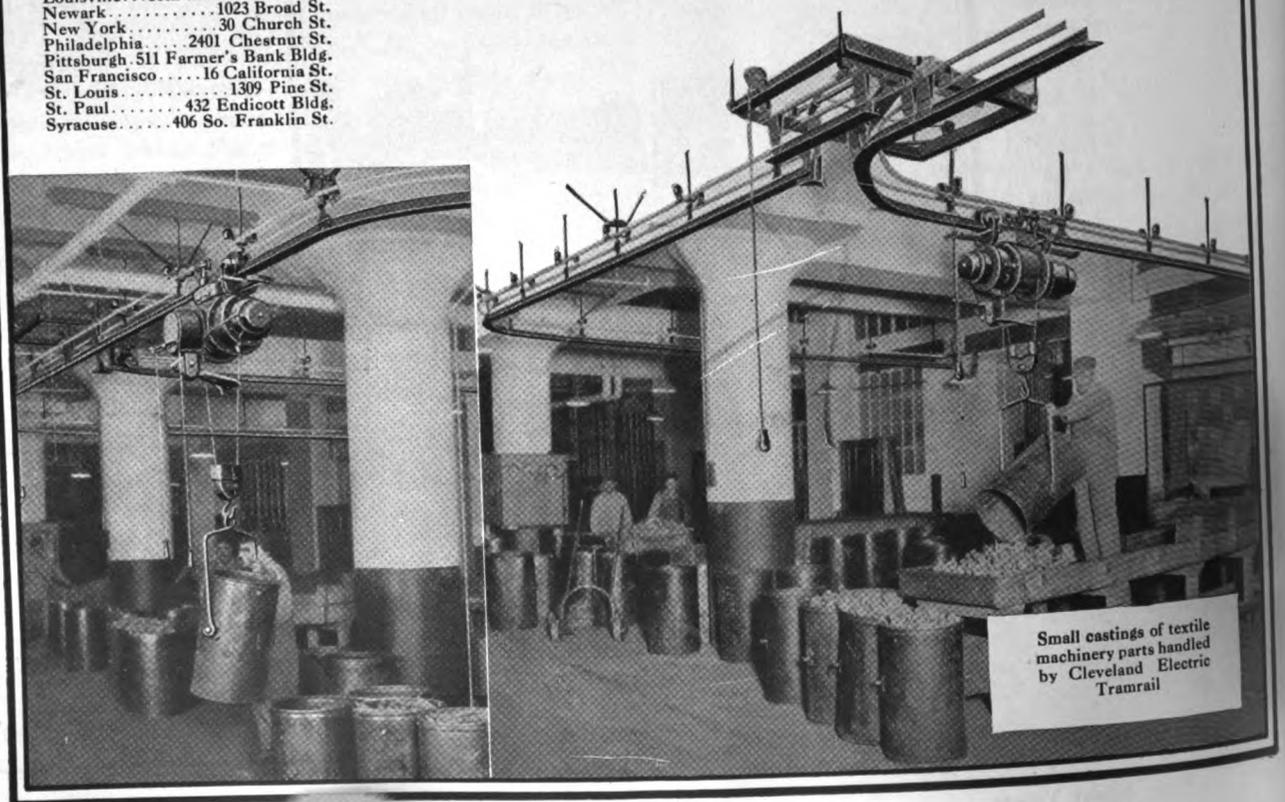
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3. Ball bearing carriers running on a smooth steel rail reduce travel time for load *and workmen*.
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Los Angeles	430 E. Third St.
Louisville	36th and Missouri Sts.
Newark	1023 Broad St.
New York	30 Church St.
Philadelphia	2401 Chestnut St.
Pittsburgh	511 Farmer's Bank Bldg.
San Francisco	16 California St.
St. Louis	1309 Pine St.
St. Paul	432 Endicott Bldg.
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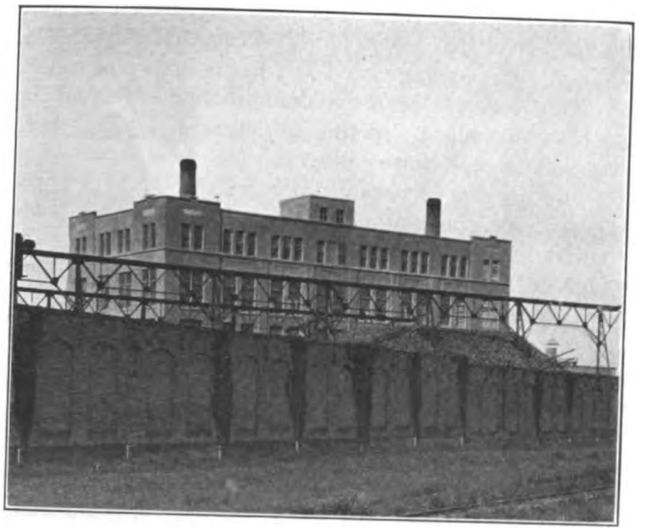


Fig. 6. Showing how the wall surrounding the plant is made ornamental, rather than drably useful.

Recreation and beneficial amusements, etc., are provided through the organization of athletic clubs, concerts, lectures, a Camera Club, Kohler Recreation Club, Tennis Club, Rifle Club, Baseball League, the Kohler Band, a Thrift Club and a Benefit Association. The company has wisely provided for musical and other upbuilding activities. An outstanding event marking this policy occurred during October, 1919, when the Kohler Civic Club arranged for two concerts by the world famous Sousa's Band. These were open to the public without charge and they were attended by more than ten thousand peop'e. In the afternoon the concert was given in the Nature Theatre—a natural amphitheatre within the village and on the edge of Ravine Park. The evening concert was given in the new engineering building. Each summer the Recreation Club holds a festival and field day for the members of the organization and their families. Sports of all kinds and free refreshments at numerous stands round out a day of a delightful community get-together.

Before this enterprise was undertaken, Mr. Kohler with his architect, Mr. Richard Philipp of Milwaukee, in 1913 made an extensive tour of American and European industrial communities. These investigations took them to Port Sunlight, England, and Essen and Dussel-



Fig. 7. Ravine Park, a recreation ground which is part of the Village development.



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IN THOUSANDS of projecting rooms—high above the heads of the "gallery gods"—you will find Dumore fractional horsepower motors working shoulder to shoulder with busy motion picture projectionists. Evenly and smoothly they deliver the power that gives life to the antics of Chaplin or to the pathos of La Marr. Swiftly and surely they rewind reels so that film may be screened again and again. Thus the operators have more time for more important tasks—enabling all of us to enjoy our "movie" with greater certainty and safety.

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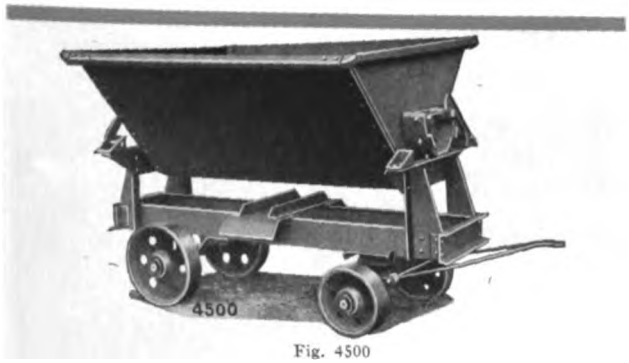


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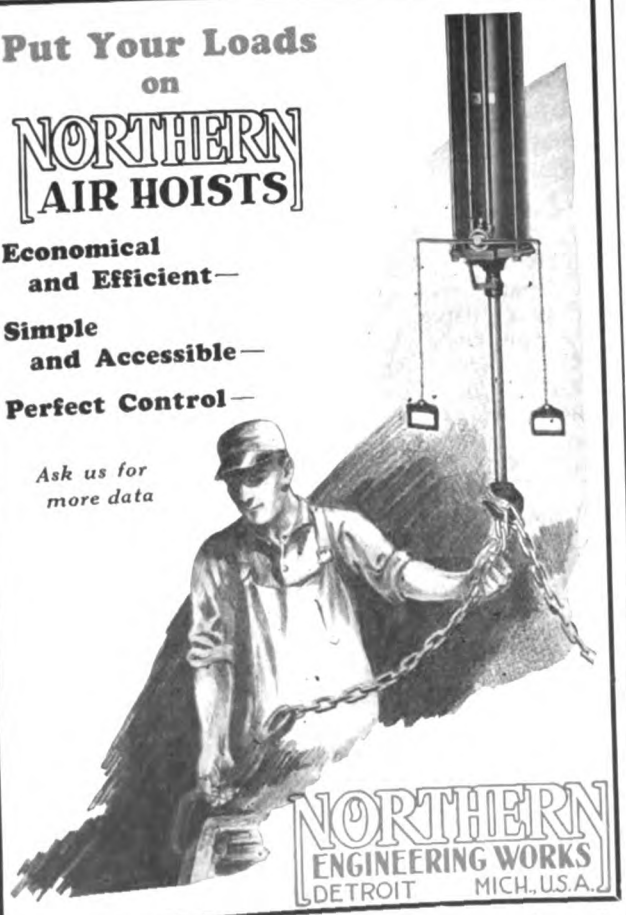
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dorf, Germany. The essentials of the village plan were completed in 1916, and in 1917 the actual physical developments were commenced in what is known as section West One directly across the main highway from the manufacturing plant. In this section seven stucco houses of six rooms each were built.

By limiting the ownership of homes to workers in the plant, outside speculators are eliminated. This holds the entire enterprise free from exploitation. Every one who has fully paid for his property has an exclusive title in fee simple and of course if not fully paid for has a tangible equity. There are no arduous requirements to the acquiring of homes, only a few restrictions to prevent nuisances and protect the neighborhood. The building company finds it difficult to keep ahead of the demand for homes. There is the closest coöperation of the people with the company and reciprocally of the company with the people. All streets are paved, public utilities are installed and their upkeep provided for by the



Fig. 8. Reading room of the American Club, Kohler Village.

incorporated village and not at the expense of the company.

In 1918 the second group of houses was commenced of brick construction. The Lincoln circle group was built in 1921. The first section is entirely completed and the overflow has spread into the south section which is almost entirely taken up.

The industrial life of Kohler is as intensely interesting as the civic and social life of the village, for the reason that the people of the village are almost altogether identified with the Kohler Company in one capacity or another. This close connection, linked with the ideal of producing only quality products, automatically reacts upon every one who is a part of the village, inevitably laying the foundation of worth while character and a wholesome coöperative attitude of the people in each other which has a most far reaching beneficial effect on the entire community.

The village has now grown to a population of about 1,500. There are over 200 occupied houses. The organization comprises 3,000 persons, and its development is really only in its infancy.

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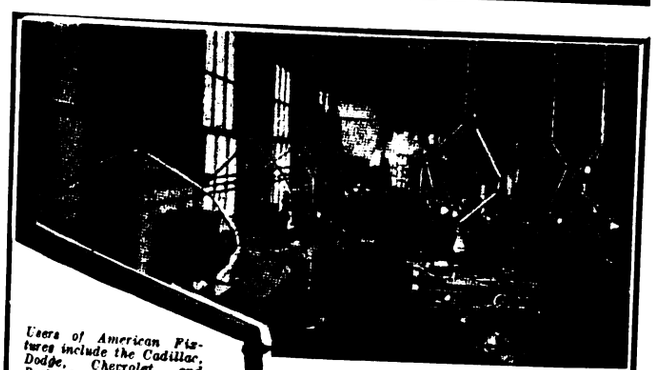


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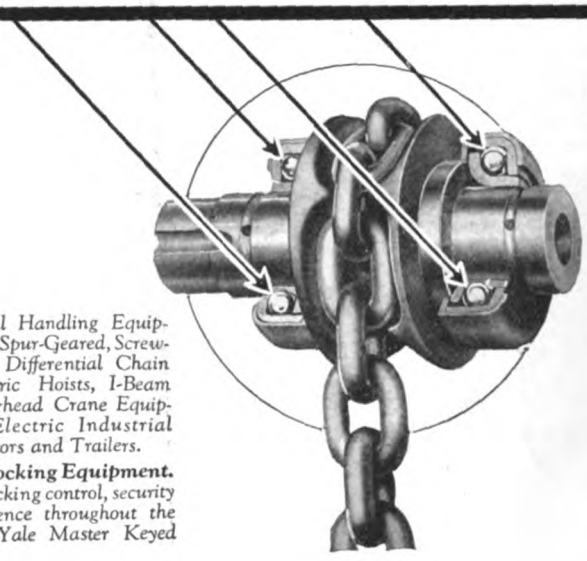


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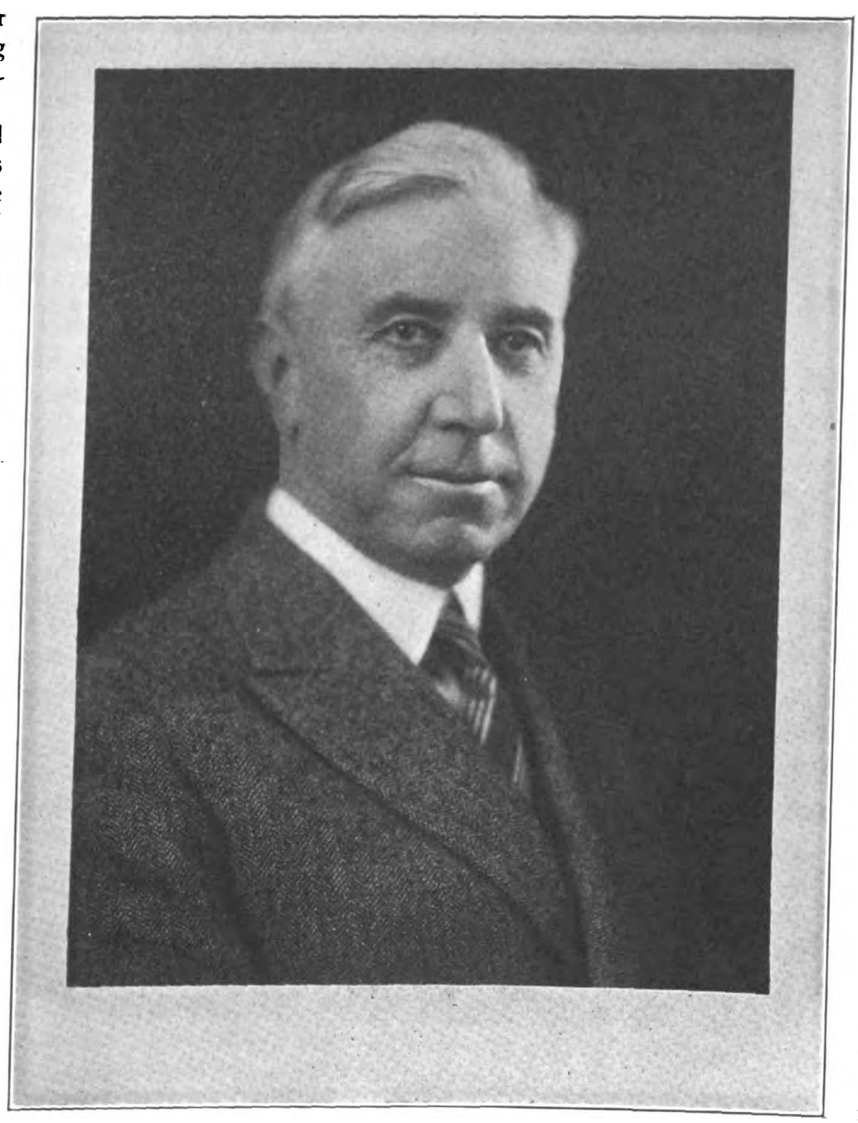
He Made His Millions After He Was Fifty

The Turn of a Coin Led Eureka Head to Fortune

SIX men who were practically "broke" sixteen years ago and who at that time had little cause to expect any appreciable improvement in their status sat around a dinner table at the Detroit Golf Club one day recently and divided $12,000,000. All were young men except the leader, who is fifty-nine, but it was due to the vision and leadership of the latter that such a meeting was ever made possible.

The financial history of Detroit's industries is replete with instances of great fortunes made from small beginnings in the motor car manufacturing field, but it is doubtful whether the early partners of the motor kings were more richly, or more quickly, rewarded than have been these early associates of Fred Wardell, founder and president of the Eureka Vacuum Cleaner Company.

Wardell himself was a "Jack of all trades" till after he had passed middle age and when he did settle down and begin to prosper, he held up his early experiences to his youthful associates and employees as an example to be avoided and he took steps to insure that they would pursue an opposite course. That is why five young department heads of the Eureka Vacuum Cleaner Company today are ranked as millionaires, that is why the labor turnover in the Eureka factory is practically nil, and that is why one of every three of the seventy-odd makes of electric cleaners made and sold in America today is a Eureka.



Fred Wardell, founder and president of a company whose original thousand dollars capital grew to twelve million dollars under his leadership and direction.

"I think these stories should be made to emphasize a moral or lesson," Mr. Wardell insisted throughout the course of the interview which led to the publication of this article. "I have made all my money since I was fifty; most of it since I was fifty-five. I wasted over half my life before I ever settled down and got started on one thing that I was fully determined to make a success of. Then when the business grew and I began to employ others, I gave them an incentive to stick and become successful with me. I told them how I had failed to accomplish anything worth while just because I never stuck to any one thing and I told them I wanted them to consider that they were taking their last job when they started to work here. I have constantly emphasized this principle ever since and it has rewarded me, as well as my associates.

"Our vice-president and general manager is only thirty-two. He started with me as a canvasser at $15 a week and in ten years became a millionaire. He quit three different times—last time he quit he wired his resignation from Chicago. If I had followed the policy of many executives, I would have sat back on my dignity and said: 'Sure, go ahead. Better men than you are waiting to take your place. Don't ever think we can't get along without you; your services haven't been any too satisfactory any way.' But I didn't follow such a policy. I had adopted a different policy long before. So when one of my men quit, I called him in and talked the matter over with him and he went

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on back to work with a thorough understanding.

"In order to tie the department heads to the business and give them an incentive to do all in their power to make it the greatest business of its kind in the world, as soon as conditions warranted it, I sold them an interest in the company and let them pay for it out of dividends. Now we are encouraging all employees to buy stock in the company and at the rate they're going they'll control the business in another five years.

"That, in my opinion, is the only way to build a successful business. I don't believe in giving away a business to the employees, but I do believe in letting them earn an interest in it. The employee who is an actual partner in the business has other interests besides quitting time and pay day. He knows that the value of his investment is directly dependent on the performance of himself and his fellows. If the company prospers, he prospers, and he is going to do all he can to promote the prosperity of the company and himself. He will work and plan for the good of the organization and he will encourage others to give their best. He will bring in good men from other places and if there are poor men in his department, he will either make them good men or he'll make them get out. He won't be developing petty grievances every few days and he won't be changing jobs every few weeks or months.

"We have all stuck to the job and worked together—that is the explanation of our success."

Flipped a Coin

Mr. Wardell became interested in electrical devices as a hobby many years ago, when he devised a penny-in-the-slot shocking machine. Next he developed a medical battery, then a vibrator, then a vacuum cleaner.

He organized the Eureka Vacuum Cleaner Company in 1909, with a capitalization of $10,000, only $1,000 of which was paid in. The Stecker Electric Company made the machines and thought so little of them that they would not take out a patent. They told Wardell he might have the patent if he cared to get one and he thought so little of it that he took a term patent instead of a design patent because the term patent was $20 cheaper.

For the first four years the employees of the Eureka Vacuum Cleaner Company numbered two: Fred Wardell, president, sales manager, advertising manager, salesman, treasurer and everything else except stenographer, which position was held by the other employee, a young woman. Mr. Wardell canvassed the country "ringing doorbells" and selling cleaners, while the stenographer took care of the office. Largely as a result of this experience, Mr. Wardell claims to have rung more doorbells than any other living man and holds the further distinction of having rung doorbells in every state in the Union.

In the meantime, he was still interested in the real estate business with his father and brothers and had other "irons in the fire." As a result of having so many and such varied interests, he was not accomplishing a great deal in any one field, so one day he flipped up a silver dollar, the turn of which was to determine his future career. "Heads, I stick with the real estate business," he said to himself; "tails, I drop everything else and give my undivided attention to my electrical devices."

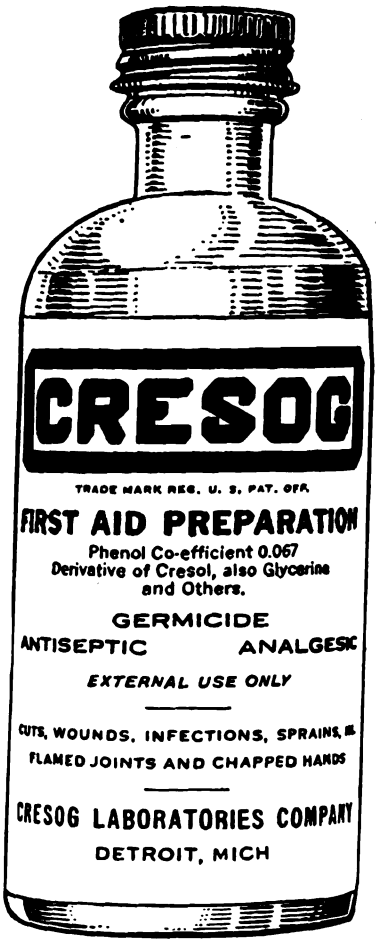
Fate, chance, luck, call it what you will, directed him to drop all else and go into the vacuum cleaner business

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Four places you can cut maintenance costs

FOUR parts of an industrial building require more than their share of attention. These four are the floors, roof, painted surfaces, and exterior walls.

On these trouble spots, you can cut your present maintenance costs to a surprisingly low level. Here is how hundreds of large industrial plants all over the country have done so.

Concrete floors—Under friction and wear, tiny particles of a concrete floor break off and float into the air. These silicate dust particles are as harsh and sharp as fine emery. They are breathed into workers' lungs; they grind away on your machinery; they damage your merchandise and equipment.

But still worse than the dust itself is the trouble that follows in its wake. For as the dusting process proceeds, holes, hollows, and worn patches develop in the concrete floor. Soon you have to patch the floor—which is unsatisfactory at best, or you have to lay a new surface. Production is held up and the repairs are costly.

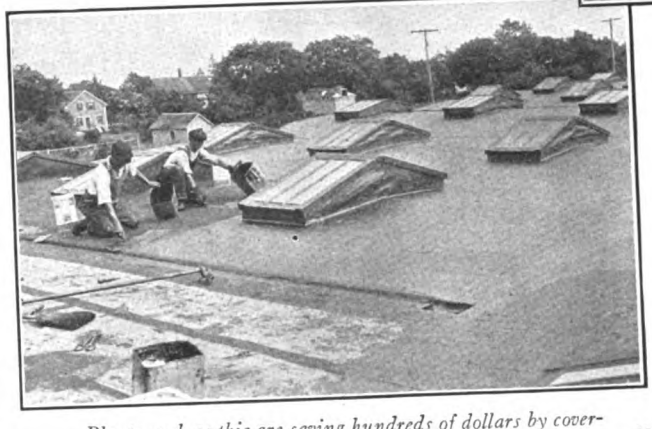
It is a simple matter to have concrete floors that will not dust and wear—floors granite-like in their hardness. A treatment with Lapidolith will do the trick. Lapidolith is a colorless liquid chemical that is flushed on the floor like water. It penetrates the concrete, fills the pores, binds the loose particles, hydrates the free lime, and changes the coarse-grained structure to a fine, even, dense surface of crystalline formation.

Lapidolith can be used on old or new floors. If it is applied at night, the surface is ready for business by morning. A Lapidolized floor withstands the hardest kind of wear. It is dustproof, wearproof, waterproof.

Exterior walls—Does water seep through your exterior walls in a driving rainstorm? Is their original beauty hard to maintain? Then you will be glad to know about Hydrocide Colorless. This material is a perfect waterproofing for brickwork. It penetrates the surface; it does not run in hot weather, for it contains no paraffine; it does not collect dust; and it can be painted. Best of all, it retains the natural beauty of any surface, for the presence of Hydrocide Colorless can not be detected on a wall. If you would have warm dry interiors for all time, use this material.

Leaky roofs—One tiny leak in a roof can cause a lot of damage and annoyance. It is easy to stop that leak quickly and permanently. Just apply a little Stormtight, in semi-liquid form if the leak is small, or plastic Stormtight if the hole is large. This thick, adhesive, rubber-like compound can be applied by anyone, over any roofing material.

It waterproofs an entire roof surface just as easily as it does a small leak. Many an old roof that was about due for renewal has been made as good as new by a coat of Stormtight.



Plants such as this are saving hundreds of dollars by covering their old roofs with Stormtight, instead of re-roofing. The men are covering some of the sizable holes with plastic Stormtight. The semi-liquid material is applied with brush.



The interior of the Whitaker Paper Company's building in Baltimore, Md., is painted with Cemcoat. Photograph shows part of the eighth floor, comprising the office, sales and display room. Note the bright cheerful appearance and the absence of glare.



Floor repairs do not worry the Continental Can Company. The quarter million feet of concrete floor in its Jersey City plant are dustproof and wearproof. The entire floor surface has been treated with Lapidolith. About 30,000 square feet of the interior is also painted with Cemcoat.

Painted surfaces—Would you prevent your white walls from turning yellow? Would you stop paint from scaling off brick, plaster, and concrete surfaces? Would you paint less often and use fewer gallons when you do paint?

Then use Cemcoat, the industrial paint that stays white longer than any similar paint on the market. Cemcoat resists heat, fumes and gases. You can wash a Cemcoated wall over and over again, and each time the paint looks as fresh and white as when it was applied. Because of its body Cemcoat usually requires one less coat than other paints on a given surface.

Furthermore, it is specially made to resist free lime—always present in a brick or concrete wall. As a rule this lime causes paint to chip and scale within a short time. Cemcoat adheres to brick, concrete or plaster just as easily as it does to wood. Made for exteriors as well as interiors, in white and colors, and in gloss, eggshell or flat enamel finishes.

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in earnest, which he did. He signed up a contract with the manufacturers for 120,000 machines to be delivered over a course of ten years, he employed salesmen, and he took personal charge of the business of providing American housewives with electric cleaners in as short a time as possible.

The organization that, sixteen years ago, consisted of one man and one woman now employs over 5,000 persons and manufactures and sells approximately one-third of all the electrical cleaners produced in the United States.

On May 5, 1925, the capital structure of the company was reorganized and 250,000 shares of common stock of no par value were listed on the New York Curb Exchange. As the stock is selling at $52 a share at the time this is written, its total value is approximately $13,000,000. The company has no preferred stock and no bonds.

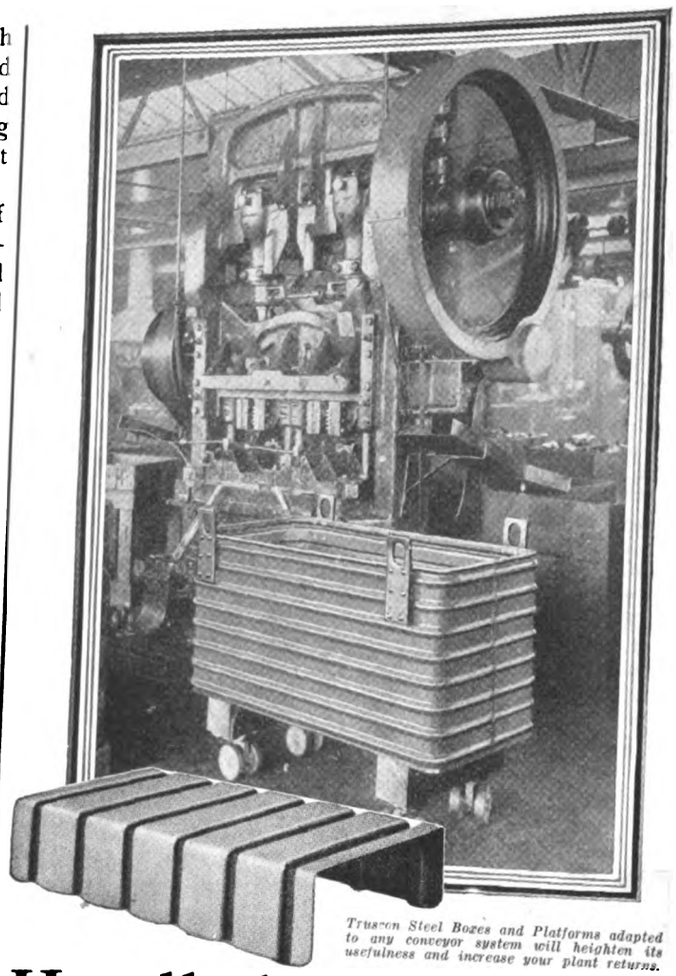
This is the melon that President Wardell and his five department heads cut the other day at that dinner party. The original $1,000 which the founder put into the business had increased to twelve million, which was split up in the form of four million in cash and eight million in securities.

Fred Wardell was born in Toronto, Canada, fifty-nine years ago, but removed to Detroit with his parents when he was eight. Here he attended school till he finished the seventh grade, when he went to work for his father, who was an auctioneer and real estate dealer. Fred got $1.50 a week at first, but had to pay 50c a week for his board. Later he was raised to $3 a week and paid $1 a week for board, then to $10 a week and $4 for board, and so on. He was one of several children, he explains, and his father believed in making them all industrious and self-reliant.

Before he had reached his majority, Fred had taken several fliers in business for himself. At one time, he had a twelve-acre poultry farm, where the present Ford Highland Park plant stands. At another time he ran a fish store and in between times he studied to be a sign painter and clerked in a shoe store.

Detroit became too small for him and he went to New York City to seek his fortune. There he secured a position as a shoe salesman and proved so industrious and clever that he was made manager of a department within four weeks. He soon realized that there is "no place like home," though, so when a brother wired him, after he had been away fifteen months, to come back to Detroit and become a member of the firm with his father and brothers, he quit without the formality of giving advance notice and hurried back home.

"I often tell of that experience," Mr. Wardell mused reminiscently. "When I left for New York, there was a crowd of friends at the station to see me off and I felt very proud and important. But when I arrived in New York there was no one at the station to meet me and I soon realized that a big city is the loneliest place in the world. When I left, after spending fifteen months in the city, there was no one at the station to tell me good bye, but when I got back to Detroit, there was the same bunch to welcome me home again. I decided then that Detroit was the city 'Where Life Is Worth Living' and I have since dissuaded many a young man from leaving home to go to a big city."



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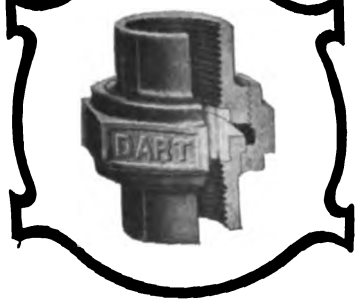
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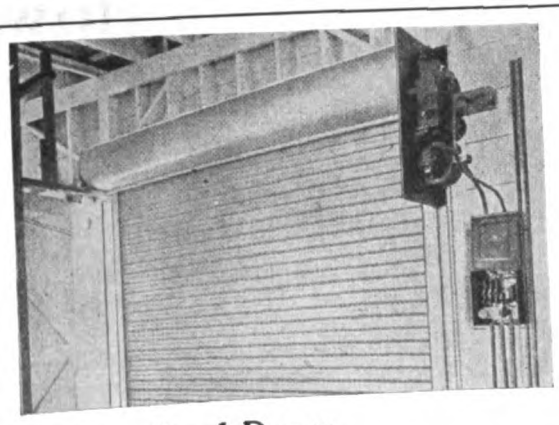
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Systematizing Repair Service

By Donald A. Hampson

THERE are thousands of simple machines and devices in daily industrial and domestic use which come up for repairs after a certain amount of service.

The process of repairing such a piece begins with an inspection, visual at first, and that followed by a disassembly if the wear is not evident outside. The workman doing the job is ordinarily engaged on manufacturing—this he must drop, and then he must collect the necessary tools for making the repair which are not the tools of manufacturing work. As the task of overhauling proceeds, first one part and then another is needed for replacement and each of them entails a trip to the stock bin or such portion of the shop in which they are kept or made.

Under such conditions, the repair is accomplished either at a loss to the factory or at an unreasonable price to the customer. Yet the "volume" of repair business is so small that a better arrangement may seem hardly

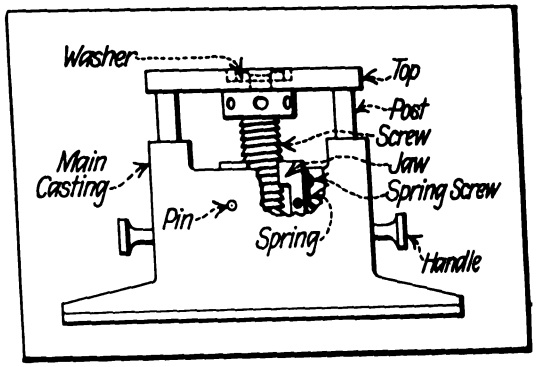


Fig. 1. The system described by the author, which applied to the jack shown above, is applicable to other similar products.

worth while—an average of one or two returns a day with occasional weeks without any repairs at all is a typical business of the kind we are discussing.

But it *is* possible to adopt a simple and rational method of repairs, such as will bring pleasure to the customer and profit to the factory. In a factory that makes a small jack of special form for one of the trades, the foreman of the department has arranged, for and by himself, a system that may well be imitated. This jack is made in five sizes, differing only in length. For clarity, a drawing of one size is shown and with it a list of the component parts.

When these jacks are sent in for repairs, the parts to be replaced are the jaws or the screw, sometimes all of them. Besides the wear on these, the handles and the springs sometimes have to be replaced because of abuse in service. The jaws are changed by removing the pivot pins and the screw by unriveting at the washer in the top. The jaws are threaded after assembling in the frame, the work being done on a special machine.

This relatively simple device is typical of those which may be returned for repairs. Depending upon the amount of use, the parts may not need renewing in ten years or it may be in only two or three. Good business demands that the charge for renewals be in proportion to that of first cost, which is quite low, and a selling point over competitive devices is the indefinite extension of life through cheap renewals of the wearing parts.

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Though seemingly simple, this device is susceptible of all the delay and loss in repair time that has been mentioned above.

By means of the repair stock scheme shown herewith and the tools arranged for the work, the cost of replacements is kept uniformly low—in fact, all repairs are now made on the flat rate basis and the concern issues a folder that gives not only the prices for new jacks, but the prices of parts and the cost of the several repairs. These repairs are graded from Class A, which is furnishing a new casting with the old working parts in it (necessary only after an accident), to Class G, which is the attaching of a new handle to one of the jaws.

A wooden box was made up to take in a series of tin containers, each of which holds one of the parts. The tin containers are 5 inches diameter by 3 deep—a stock container—and adopted in preference to that of partitioning off the box with wood because they are brighter and cleaner looking and because any one may be removed without disturbing the rest should it be desired to take it to the stock room for replenishing or to dump out an accumulation of dirt in the bottom.

Here, in one small area, are all the parts required for

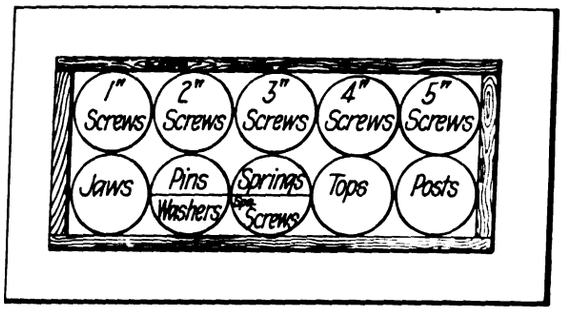
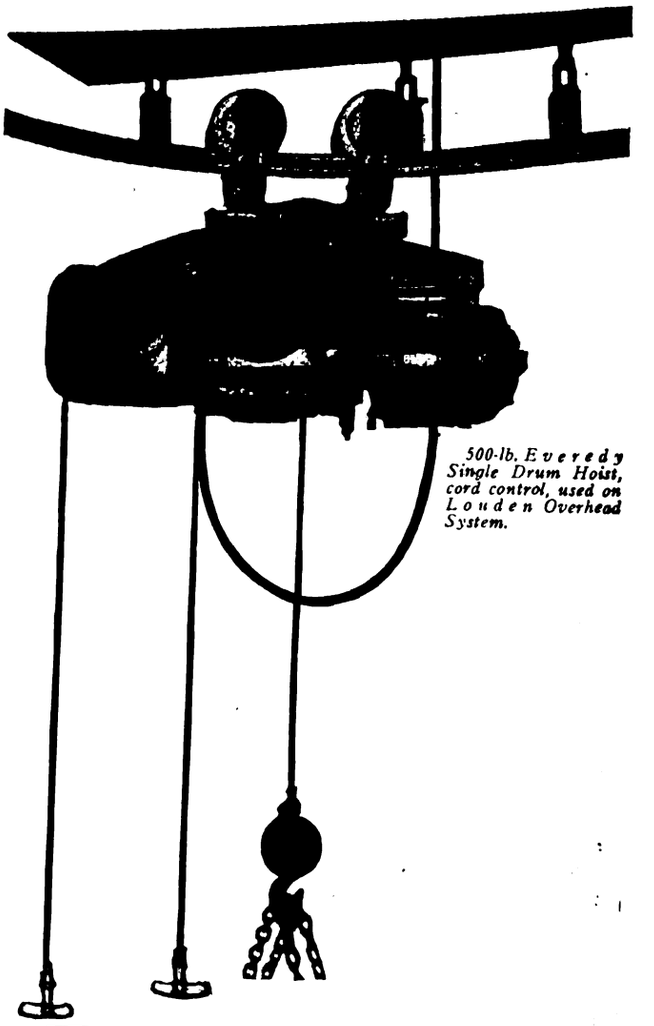


Fig. 2. This simple wooden box, and its ten containers, comprise the "stock room" of the repair system.

all repairs except Class A, which are rare. This repair box is kept on a bench in a space three feet wide that is partitioned off and maintained for that sole purpose. Within that space also, there are kept the necessary tools such as screw driver, hammer and punches. When jacks come in for repairs, they are laid on this bench and with them a printed slip on which the workman designates the kind of repairs he makes; this slip is kept with the jacks as they are returned to the outgoing department and the customer is billed in accordance.

The workman in the jack department who ranks next to the foreman is detailed to do the repair work and he goes to the repair bench twice a day to see if anything has come in. As his other duties entail a certain amount of running around, he can keep track of this without making unnecessary trips and he arranges the work to suit his other duties.

A certain difference is made in processes also. On the new jacks that are manufactured, the screws are secured to the heads by a rivet spinning machine, pivot pins are inserted in a bench press, and so forth. In repairs, riveting is done by hand with hammer and punch, pins are driven in and out by hand, and burrs are removed with a flie instead of on grinding machines. The quantity of work being done and the personal attention required anyway make the hand method quicker and better for repair work; moreover, the workers on production are not interrupted to fuss with a single special piece.



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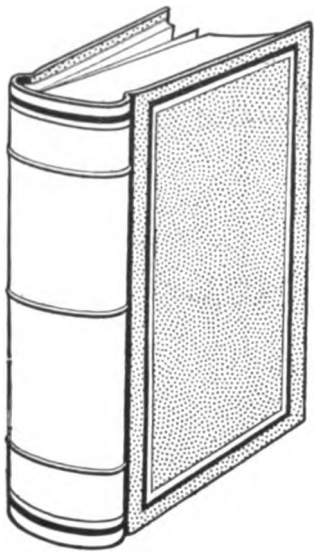
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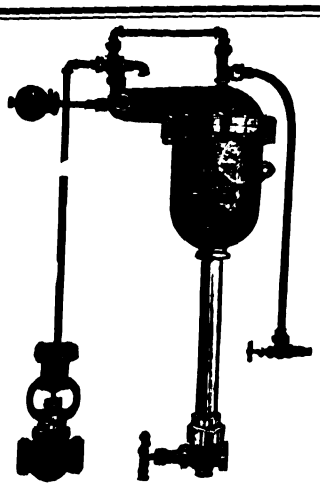
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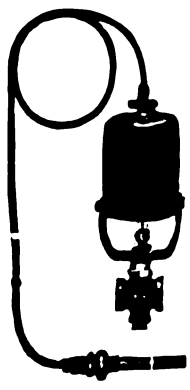
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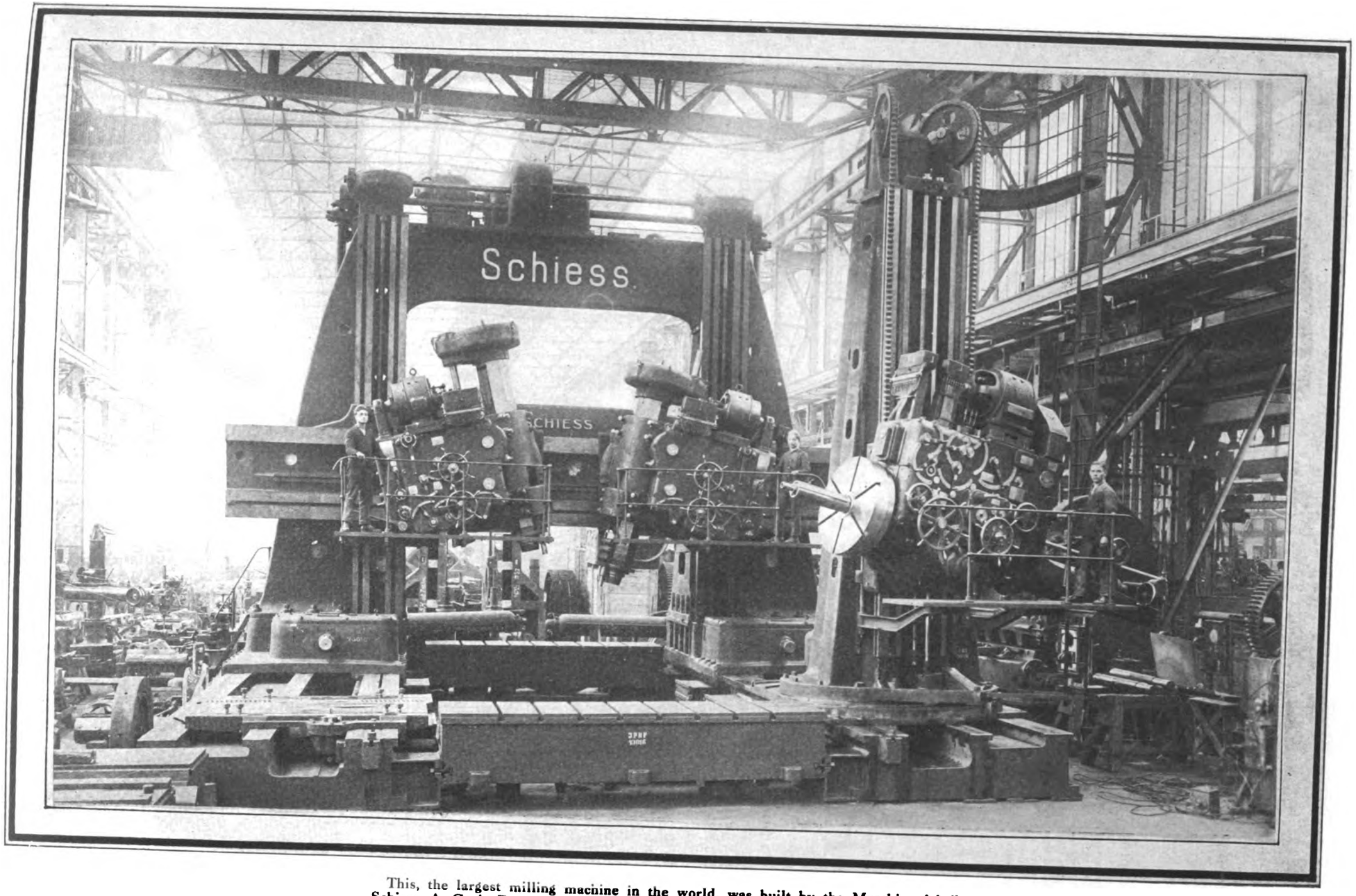




Tycos Temperature Instruments

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This, the largest milling machine in the world, was built by the Maschinenfabrik Schiess, A. G., in Duesseldorf, Germany. It is 26 ft. high and weighs 380 tons. The width between standards is 14′ 9″, the milling length is 65′ 7″, and the table length 78′ 9″. The machine incorporates the latest improvements in machine design and electrical equipment.

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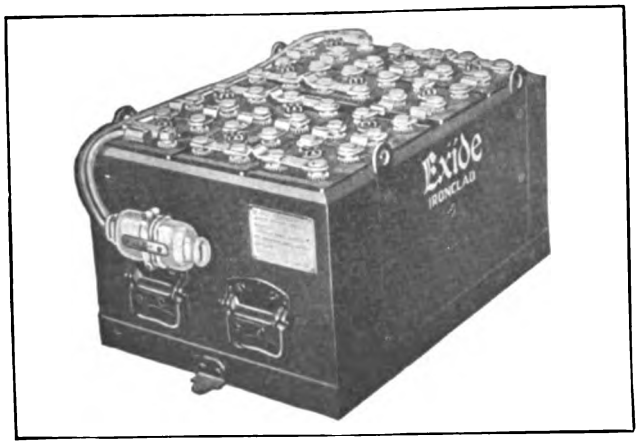
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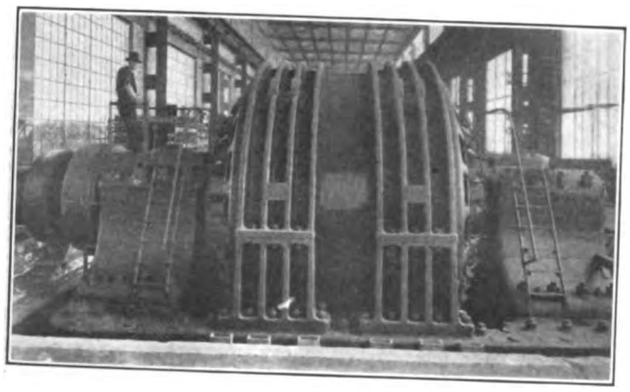
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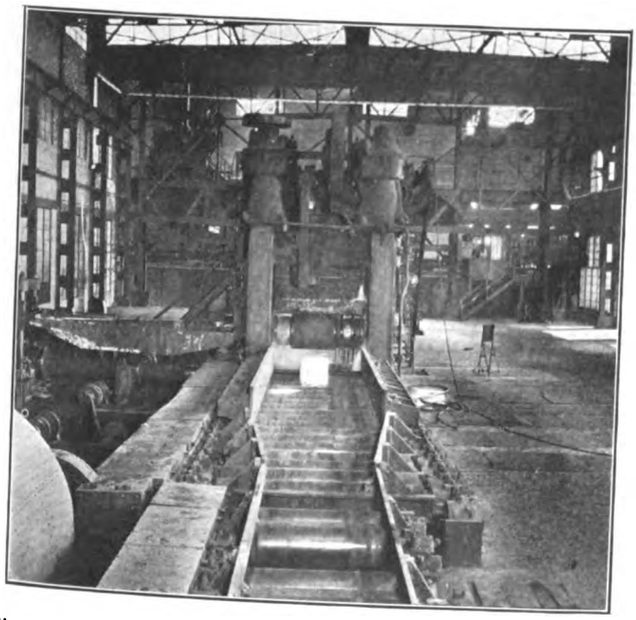
Motor Weighs 100 Tons

THIS motor, which is capable of delivering 17,000 horsepower, was made by the General Electric Company and drives a blooming mill in the Bethlehem Steel Company's plant at Sparrows Point, Md. Its enormous 30-foot shaft carries two armatures and the total weight of shaft and armatures is 242,000 pounds. This shaft revolves at a normal rate of 50 revolutions per minute but is capable of developing a speed of 120



revolutions per minute in either direction. In actual operation, the motor has been reversed from 90 revolutions per minute in one direction to the same speed in the opposite direction in three seconds.

An interesting feature of this motor is that, while it can reach a maximum output of 17,000 horsepower, these "peaks" in load do not require the use of excessive electric power. This is due to the fact that the motor-generator which supplies the motor's power is equipped with a flywheel which acts as a balance and



literally stores energy when the big motor is "running light" and delivers it when the motor needs it. The maximum power which the motor-generator will draw from the line is approximately 3,000 kilowatts. This would be much more if it were not for the flywheel.

An ingot is shown on the "table" of the blooming mill which the large motor drives, just having emerged from the rolls. The two shafts at the left drive the mill rolls, the upper being geared to the lower, which is connected to the motor shaft in the next room.

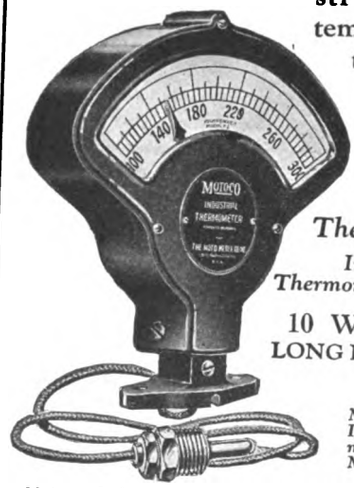


The Motoco Thermometer brings the temperature right to the desk of the superintendent or foreman. Permits watching heat-treating processes 50 ft. away to see that nothing goes wrong.

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Fig. 117
Screwed, Standard Bronze Horizontal Check Valve.



Fig. 106
Screwed, Standard Bronze Globe Valve.

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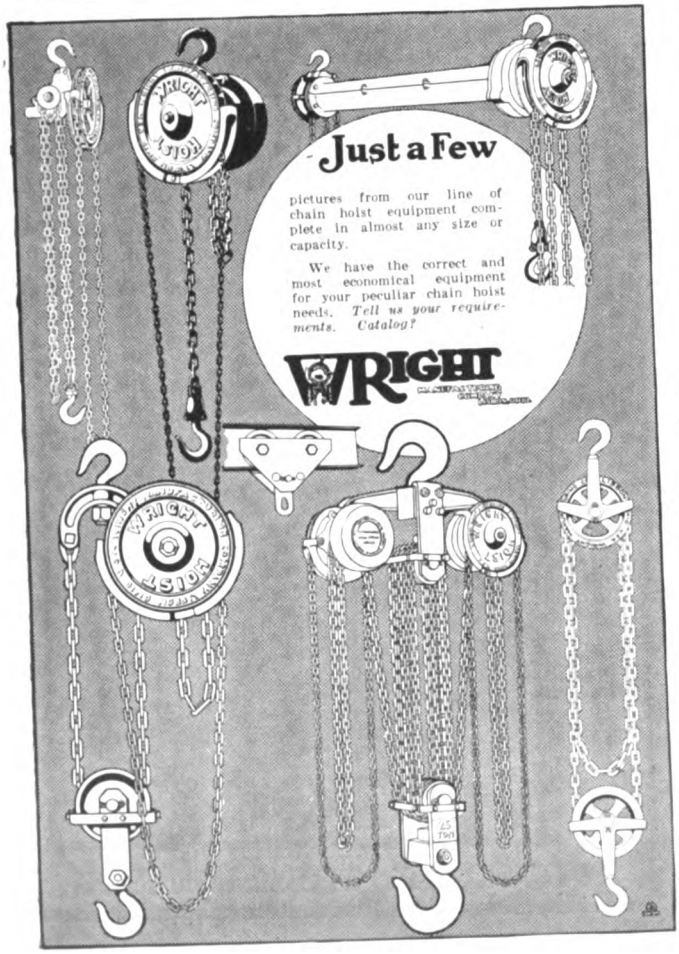
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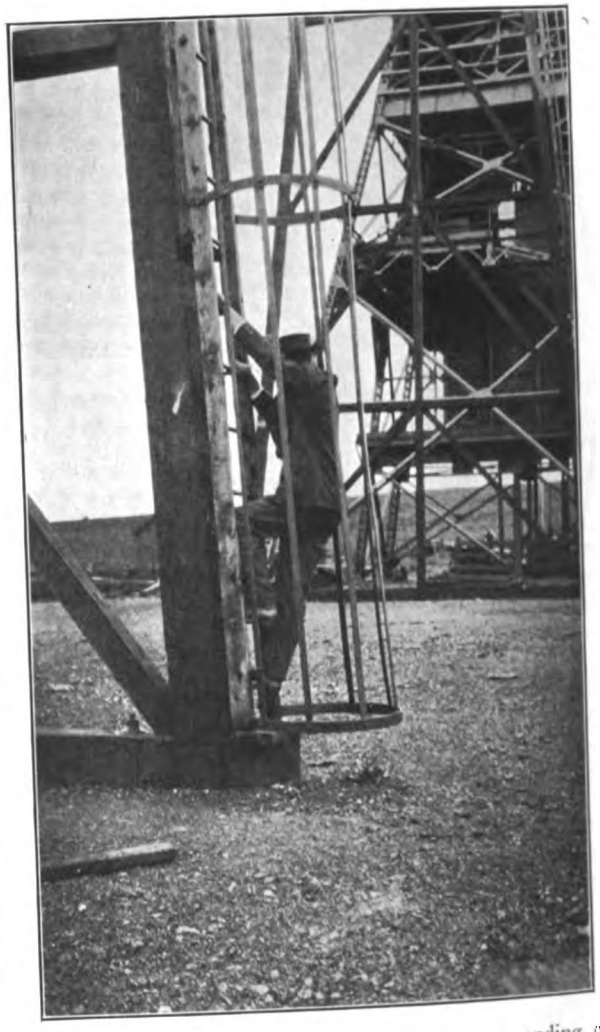
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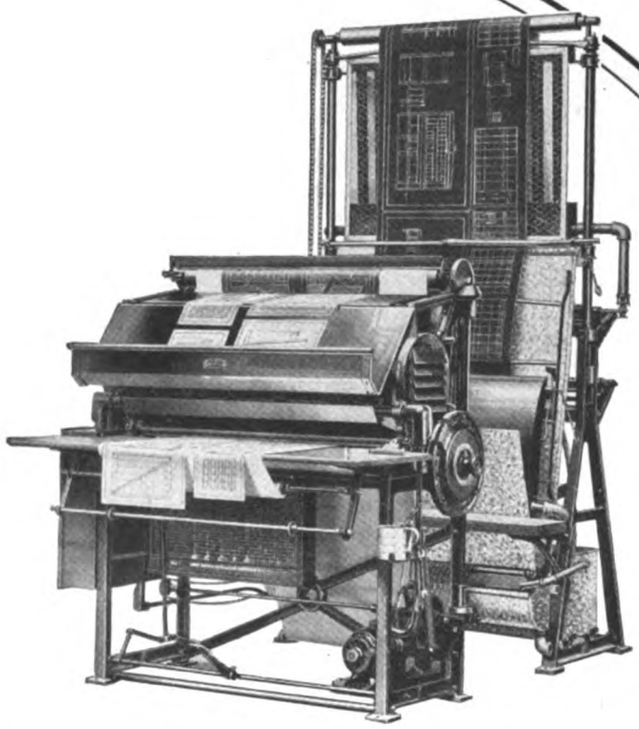


Handbook of Safety and Accident Prevention

The first complete handbook of safety and accident prevention will be published in a few weeks. It is compiled by Fred G. Lange, formerly Director of Safety of the Industrial Commission of Ohio, and published by the Engineering Magazine Company, 120 West Thirty-second Street, New York City.

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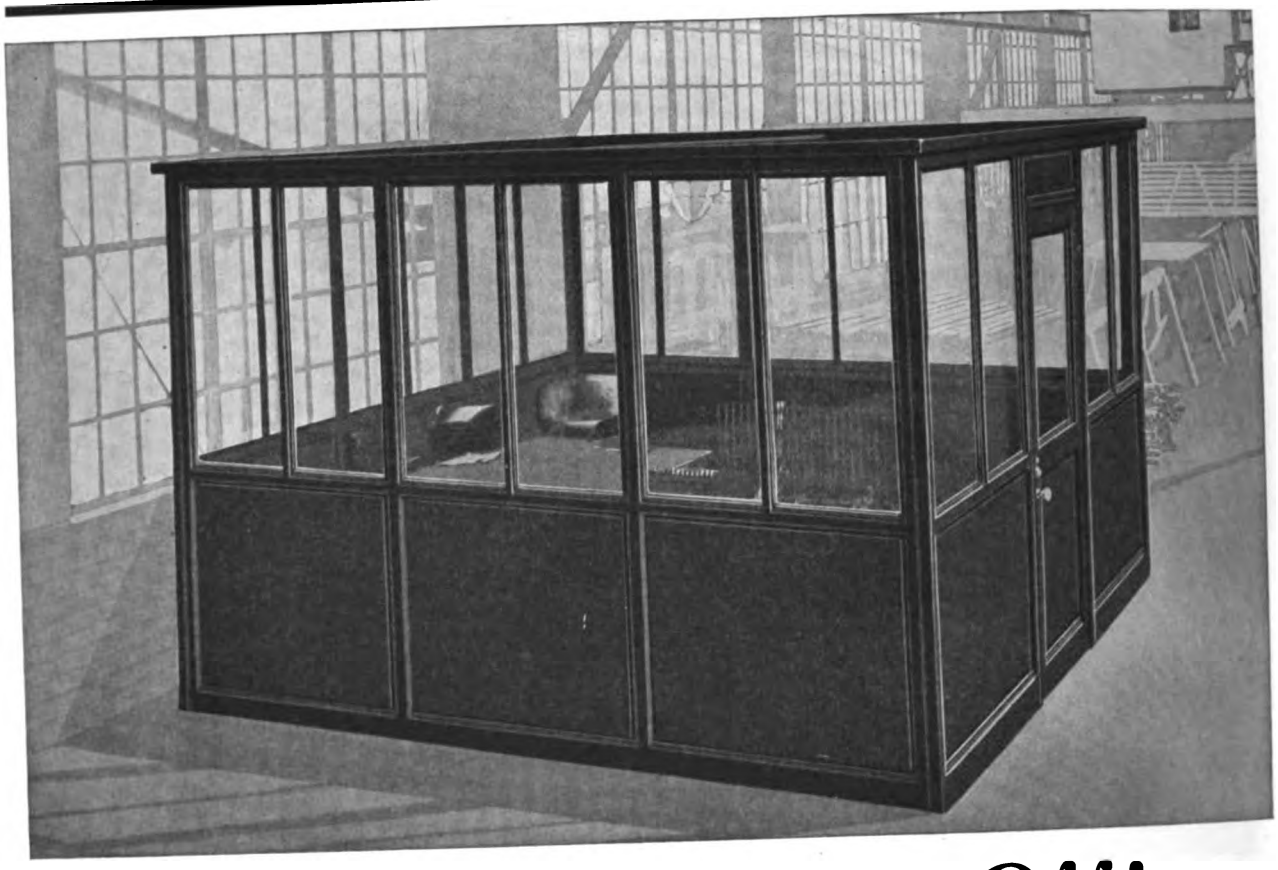
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Fig. 1. Loading sulphur, at the sulphur mines in Louisiana.

"Robbing Satan"

Where Sulphur Comes From and How

By E. R. Gammage

ON a fair Monday morning a few days ago, a news camera man of one of the large weeklies was permitted to take his camera and enter the Union Sulphur Mine, of Sulphur Mines, Louisiana. This is the first time in the history of the mines that a camera has been permitted to be taken into the mines to photograph for the news service. If you have been fortunate enough to be a visitor to the seventh wonder of the world and have had a kodak, no doubt you have had some experience in checking your camera before being allowed to enter the mines.

The mines are located in Western Louisiana in Calcasieu Parish and furnish employment to something like nine hundred men. I have been through the mines on several trips and have never heard a single complaint from any one of these nine hundred laborers. The wages are far above the average wages paid by the general industries for such work. The mines take good care of their laborers in the housing problem as the company owns and rents the laborers homes at $1.00 per room with light and water furnished free of charge. Calcasieu Parish receives thirty-seven per cent. of its taxation from the mines, and many of the wonderful highways and fine school buildings come largely from the assessment of a special tax on the Parish by the voters of the Parish.



Fig. 2. A flowing sulphur well. (See Fig. 3).

It is commonly stated by the old timers that a Mr. E. Escoubas traded the sixty acres that is the mine proper to another man for a $20.00 pony and bragged about beating the man he traded with. All this was away back in the 1850's.

The deposits of sulphur were found in 1858 by a party exploring for oil. Prior to that date sulphur had been imported into the United States, the supply coming mostly from Sicily. Important supplies of sulphur are also worked at several locations in Japan, Chile and Peru. Russia possesses large deposits. Prior to the supply of sulphur discovery in Louisiana, sulphur consumption in this country was entirely imported.

The Louisiana mine, from which the world receives its largest sulphur supply, is unlike most sulphur mines because of the unique process employed in working the sulphur deposit. Until recent years, it was the only mine of its kind and the only commercial sulphur mine in the United States. Important sulphur deposits in Texas are now being worked by the same method, courts having ruled that the Union Sulphur Company's pat-

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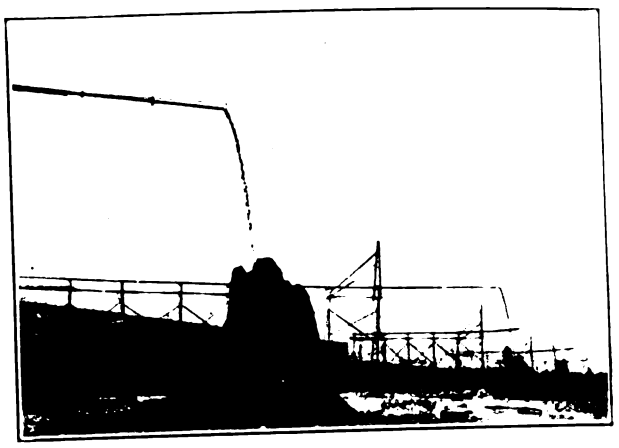


Fig. 3. Five pipe lines, through which flows the sulphur from fifteen wells. Pipes are driven down to the sulphur, underground, and superheated steam melts it. An inside pipe forces compressed air into the mass and drives it up through the outer pipes.

ents on the process of extraction have expired.

Briefly, the Louisiana deposits are worked by what is known as the Herman Frasch Process. In 1891, Mr. Herman Frasch devised a patent process to sink a bore hole down to the sulphur deposits in the same manner as an oil well is drilled and then let in five pipes centrally arranged, the outer being 12 inch, the next casing 10 inch and the innermost 6-5-2 inch. The operation consists in forcing down the 6- and 5-inch pipes, superheated steam at 300 degrees Fahrenheit to melt the sulphur. Compressed air is driven down the 2-inch pipe and bubbles into the melted sulphur and water; the specific gravity of the sulphur is greatly diminished so that it rises to the surface through the outer pipes. It is then run off to settling bins. Steam lines are placed inside the pipe lines in order to keep the sulphur molten while it is being piped to the bins.

Large bins are constructed of board inclosures into which the sulphur is poured. It takes the molten sulphur from six to eight months to cool off before being blasted by huge charges of dynamite which usually break up from 500 to 1,000 cars of rock sulphur.

Most all sulphur supplies are exported to European markets via Sabine Pass, Texas, by the companies owning steamers. All American sulphur is marketed through the American Sulphur Company in the European markets.

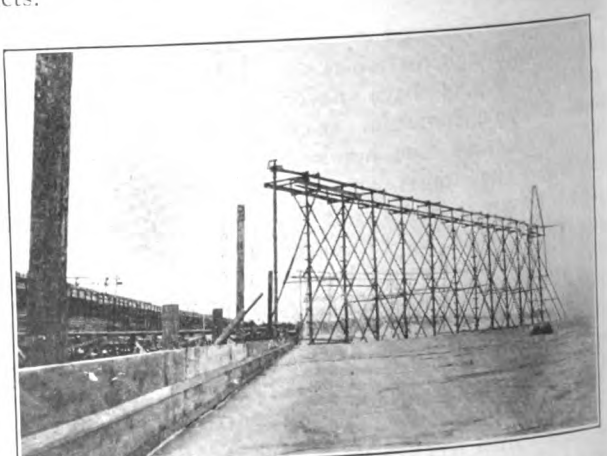
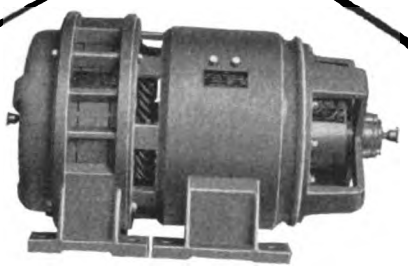


Fig. 4. One of the board-enclosed bins, and part of a steam line leading to one of the sulphur wells.

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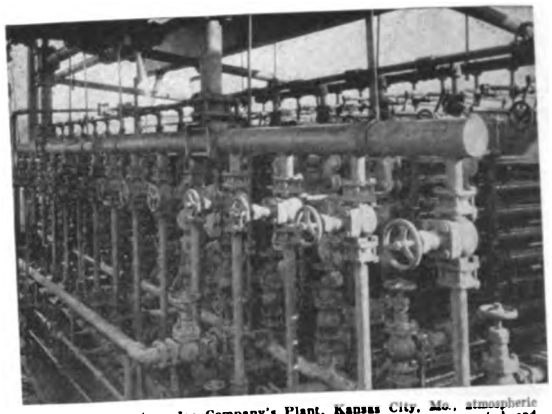
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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

"The Use, Abuse and Proper Care of Scales"
is the title of a booklet recently added to the literature being distributed by the Howe Scale Co., of Rutland, Vt.

Chucking Automatics
This Model H, 4½ inch type of Gridley four-spindle chucking automatic machine is described in a bulletin issued by the National Acme Co., Windsor, Vt.

Die Stocks and Pipe Cutters
Easy working die stocks and square-end pipe cutters are described in Catalog No. 25, which is being issued by the Borden Co., Warren, Ohio.

Pipe Machines
An illustrated catalog on the subjects of pipe threading and cutting-off machines, rolling cutter and die grinders is being issued by the Bignall & Keeler Machine Works, of the N. O. Nelson Mfg. Co., of Edwardsville, Ill.

Empress Oil and Grease Cups
are described in Catalogs Nos. 8 and 103, which have been issued by the Bowen Products Corp., of Auburn, N. Y.

Standard Pneumatic Tube Systems
which is the subject of Catalog 4, has been issued by the Standard Conveyor Co., North St. Paul, Minn.

"Forty Years of Progress"
is the title of a 64-page illustrated booklet containing a history of the growth of the Harnischfeger Corp., of Milwaukee, Wis.

Trolley Bucket Conveyors
are described in an illustrated bulletin which has been issued by the Gifford-Wood Co., of Hudson, N. Y.

Thor Electric Tools
These tools are described in a new illustrated folder, which is being issued by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill.

Repulsion-Start, Induction, Single-Phase Motors
are described in a folder recently issued by the Century Electric Co., St. Louis, Mo.

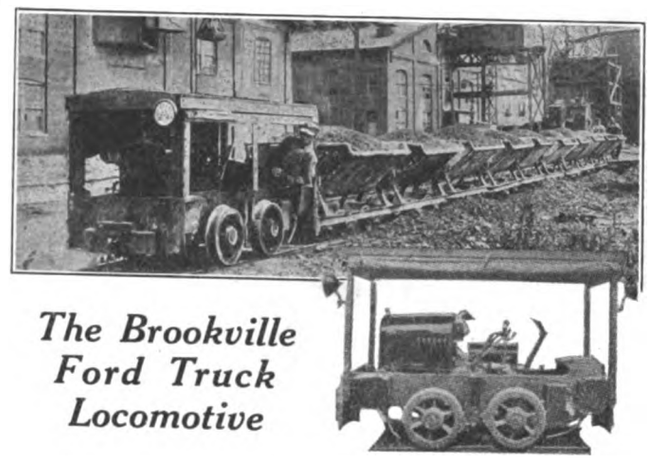
Dust Collecting Equipment—Perfecto Filters
"Dracco" equipment of this type has been described in a booklet recently issued by the Dust Recovering and Conveying Co., Cleveland, Ohio.

Roof Standards
This subject illustrating the application of pre-cast reinforced concrete slabs to all types of roof construction has been put into book form and issued by the Federal Cement Tile Co., 608 So. Dearborn St., Chicago, Ill.

Adsco System of Heating
"The Adsco System of Atmospheric Steam (Vapor) Heating" is the title of a 16-page booklet issued by the American District Steam Co., North Tonawanda, N. Y.

Flat Roof Specifications
A 35-page booklet entitled "Architects' and Engineers' Built-Up Roofing Reference Series" is the first of a series being issued by The Barrett Co., 40 Rector St., New York.

"How Should You Buy a Heating System?"
is answered in a folder which describes the Webster



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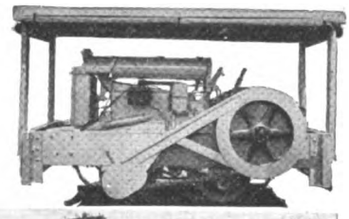
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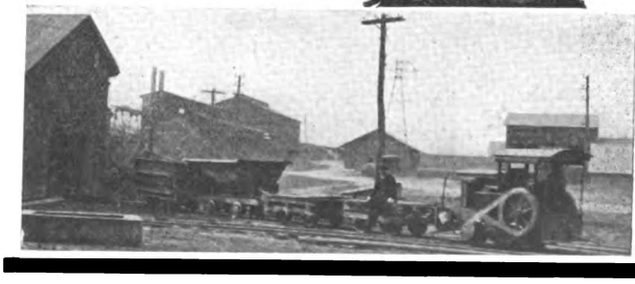
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Specifications

Brookville Locomotives are manufactured in two types—the Brookville Fordson Locomotive and the Brookville Ford Ton Truck Locomotive. The Brookville Fordson Locomotive uses as its power-unit the standard Fordson Tractor, positively without change or alteration other than discarding the wheels and complete front axle and steering assembly. The Brookville Ford Ton Truck Locomotive uses as the power-unit the Ford one-ton Truck throughout, including Ford motor, transmission and differential.

Brookville Fordson Locomotive





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Piling heavy cases in narrow aisles with a motor driven Revolvator

All the Big "Generals" Are Using Revolvators

General Chemical Co.	5
General Cigar Co.	8
General Electric Co.	35
General Motor Co.	47
General Roofing Co.	3
General Adding Machine Co.	1
General Asbestos & Rubber Co.	2
General Abrasive Co.	1
General Bakelite Co.	4
General Fire Extinguisher Co.	2
	108

Here are 10 "Generals" using 108 Revolvators. If good enough for the "Generals" how about the rank and file?

Send for Bulletin IND—today

Revolvators Lifters — Pilers Stackers — Elevators Liftrucks — Tierers Barrel Racks

REVOLVATOR CO.

322 Garfield Ave. — Jersey City, N. J.

Reduce Your Oxygen Costs

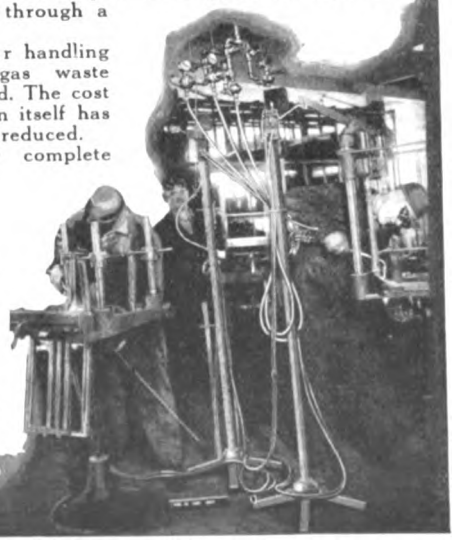
Oxygen of a minimum purity of 99.5% can be extracted from the air at a tremendous saving over the cost of oxygen in cylinders by an

OXECO LIQUEFACTION OXYGEN PRODUCING PLANT

The illustration shows one step in the manufacture of metal furniture in the plant of the Simmons Company, Kenosha, Wisconsin. An OXECO plant on the premises supplies all welders with oxygen through a pipe line.

Cylinder handling costs and gas waste are eliminated. The cost of the oxygen itself has been greatly reduced.

Write for complete information.



KEITH DUNHAM COMPANY

110 So. Dearborn St., Chicago, U. S. A.

System of Steam Heating by Warren Webster & Co., of Camden, N. J.

Chains for Conveyors and Elevators

Link-Belt Drop Forged Rivetless Chains are described in Book No. 755, which has been published by the Link-Belt Co., of Chicago, Ill.

"Automatic Control of Planers Direct-Connected to Motors"

is the title of Publication C-14, which has been issued by the Cutler-Hammer Mfg. Co., Milwaukee, Wis.

Pressure Regulating Devices

including reducing valves, pump regulators, balanced valves, draft regulators, are described in Catalog No. 62, issued by the Mason Regulator Co., of Boston, Mass.

Roto Pneumatic Grinders

which are being manufactured by The Warner & Swasey Co., Cleveland, Ohio, are described in a 12-page booklet recently issued.

Collar Oil Bearings

Bulletin No. 112, describing the Hill Collar Oil Bearing of the Cleveland type, has been issued by The Hill Clutch Co., Cleveland, Ohio.

Truscon Products

which include steel buildings, steel columns, windows, doors, joists, etc., are described in a 16-page booklet issued by the Truscon Steel Co., Youngstown, Ohio.

Evaporator Set

of the Reilly type is described in Form No. 401 issued by the Griscom-Russell Co., 90 West St., New York.

Steam Jet Cinder Conveyor

A report on the American steam jet cinder conveyor installed at the Terminal Power Plant, Illinois Central Railroad, Mattoon, Ill., has been issued by the Conveyors Corp. of America, 326 West Madison St., Chicago, Ill.

Auto-Start Motor

An illustrated folder on the United States auto-start motor of the automatic self-starting squirrel-cage type, has been issued by the United States Electrical Mfg. Co., Los Angeles, Calif.

Helical Springs

A booklet containing some notes on the design, manufacture and performance of helical springs has been issued by John Chatillon & Sons, New York.

Beet and Sugar Machinery

A profusely illustrated catalog containing descriptions of all classes of modern machinery for beet and cane sugar factories and refineries, published by The Kilby Mfg. Co., Cleveland, Ohio.

Trackless Door Hanger

Descriptive literature describing the Globe Trackless Door Hanger has been issued by the Globe Railway Equipment Co., Railway Exchange Bldg., St. Louis, Mo.

Equipment for the Iron and Steel Industry

is described in Bulletin 80 containing 40 pages of illustrations and data which has been issued by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

Automatic Arc Welding

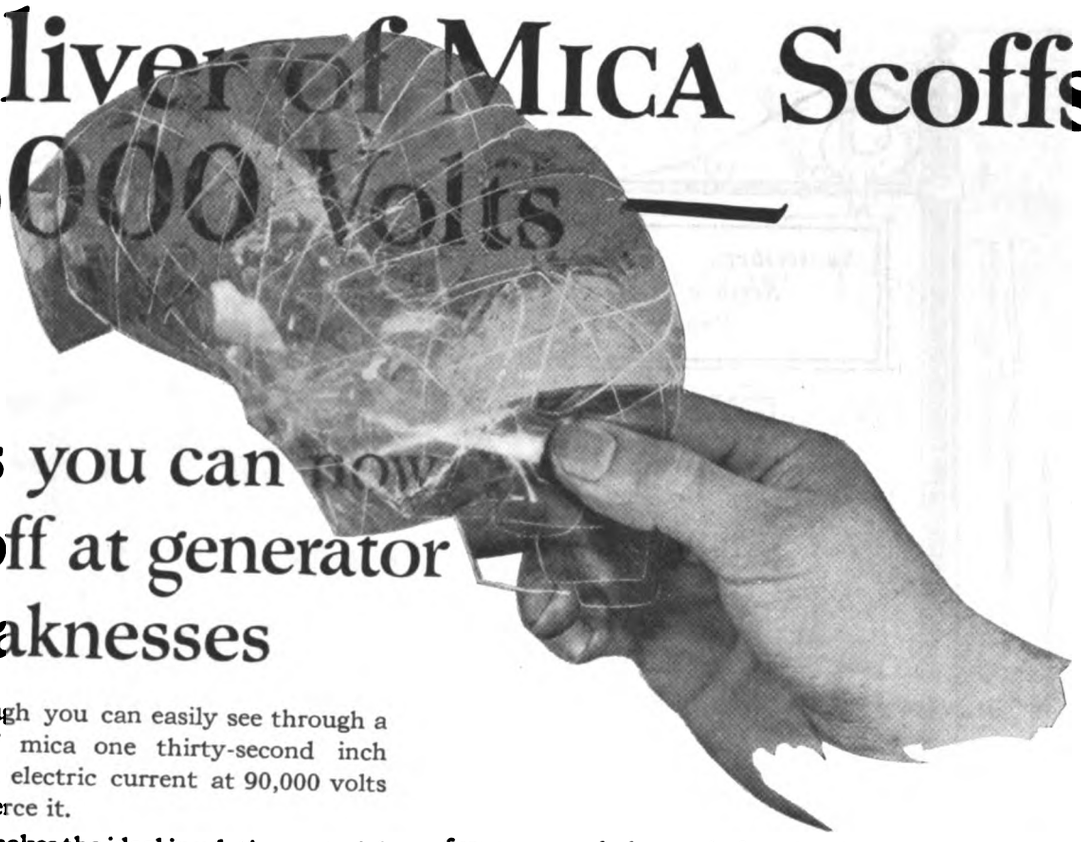
Booklet No. 48937.1, containing 20 pages, illustrates and describes this subject. Published by the General Electric Co., Schenectady, N. Y.

Automatic Starters for Synchronous Motors

Electric Machinery Mfg. Co., Minneapolis, Minn., has issued Bulletin No. 799, which describes and illustrates this subject.

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A Sliver of MICA Scoffs at 30000 Volts —



— as you can now scoff at generator weaknesses

Although you can easily see through a sliver of mica one thirty-second inch thick, an electric current at 90,000 volts won't pierce it.

Mica makes the ideal insulating material and that's why you will find more of it in Westinghouse generators than in any other generators. The coil insulation of a Westinghouse generator is mica throughout the entire length of the core. This applies to all generators at all voltages. It is an assurance to you of satisfactory service.

Mica is unaffected by high temperatures—that's the reason it is used for furnace peepholes and for the front of ordinary stoves.

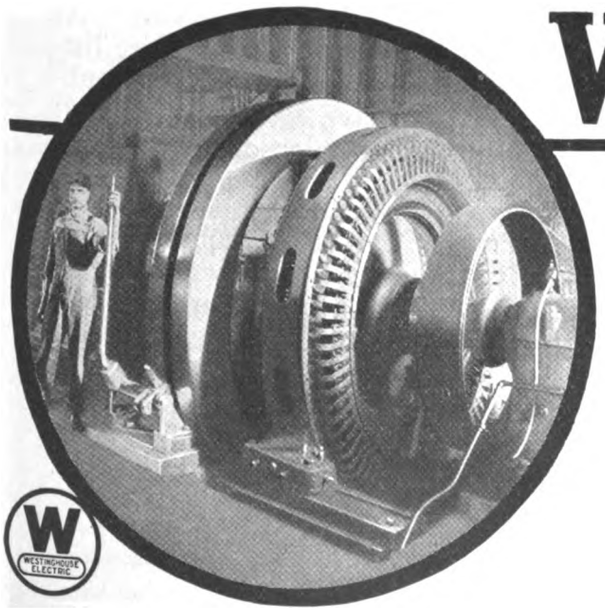
Mica is unaffected by the acid resulting from static discharge. It is also unaffected by moisture or atmosphere.

Mica costs more than ordinary insulating materials, but it *gives* more to you in service. That's why Westinghouse has found a way to use it generously, just as it found a way to build the original generators which harnessed Niagara.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

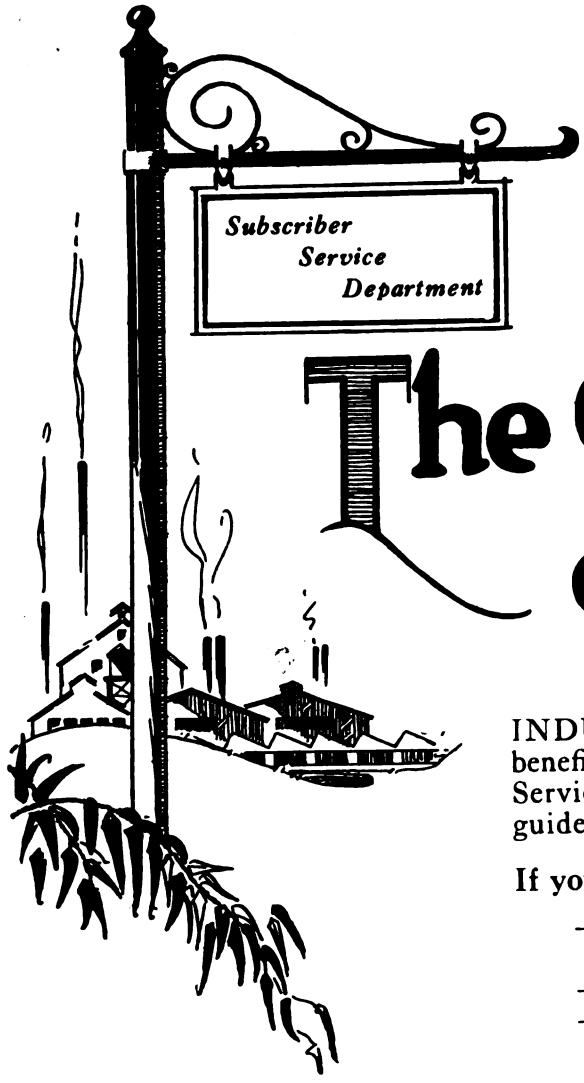
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Westinghouse Type E Engine Driven Generator

A distinguishing characteristic of Westinghouse generators is their high efficiency at normal operating loads as well as when the generator is operating at full capacity.

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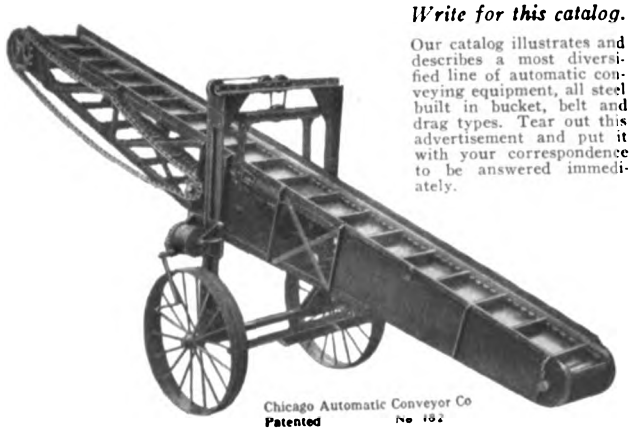
Locate your Storage Piles where it is most efficient to have them—

Several cars are shunted on your spur. Your coal or raw materials have come in. Thus far materials have cost you so much in dollars and cents. Now comes the handling to storage piles—*what is that costing you?* Don't allow inefficient materials handling methods to swell plant operation costs.

Locate your storage piles where it is most efficient to have them—coal in your bins close to the boiler room, raw materials close to the first step in your manufacturing process. Chicago Automatic Conveyors will get it there from the cars at the lowest possible cost. The illustration shows a splendid example of how many manufacturers convey materials, even hundreds of feet, to storage piles, with Chicago Automatic Conveyors, requiring only a few men—a considerably less labor gang than would be required by other methods.

Write for this catalog.

Our catalog illustrates and describes a most diversified line of automatic conveying equipment, all steel built in bucket, belt and drag types. Tear out this advertisement and put it with your correspondence to be answered immediately.



Chicago Automatic Conveyor Co.
982 Old Colony Bldg., Chicago, Ill.

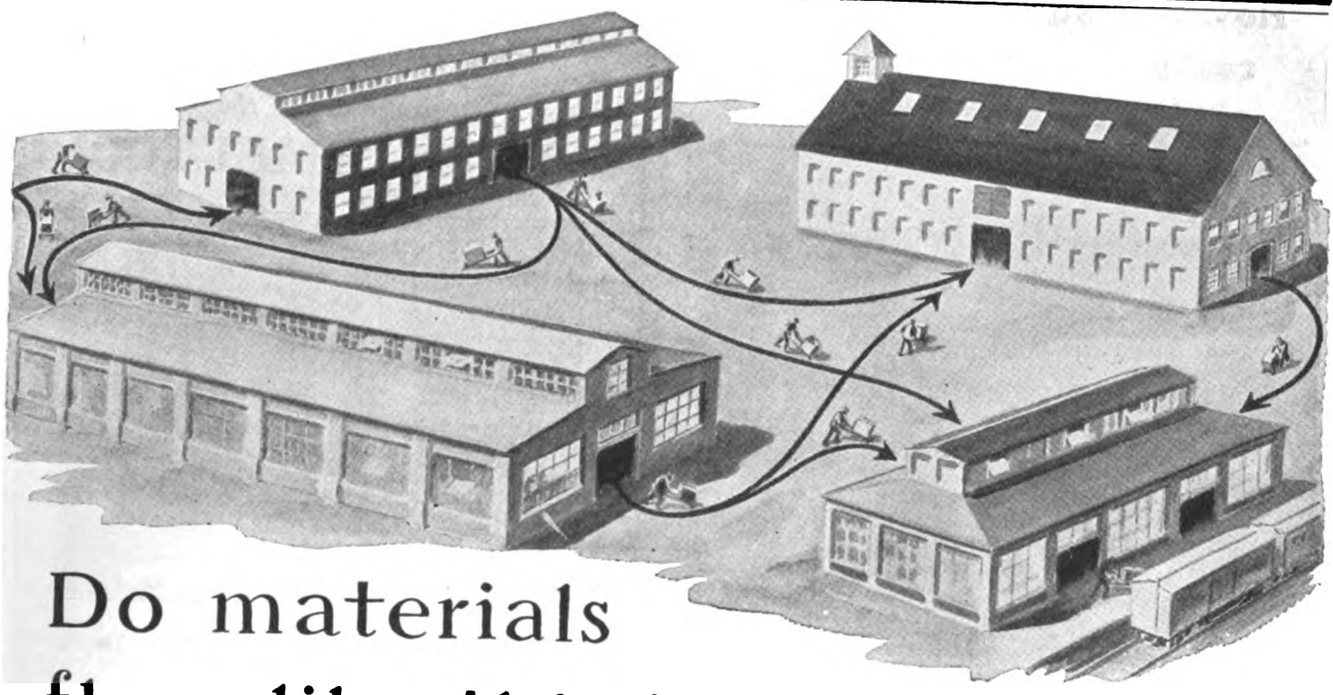
Best Lighted Building in the World

THIS is the claim of electrical men of the Pacific Coast, after viewing the new million-dollar office home of the San Joaquin Light and Power Corporation, Fresno, California. With three hundred floodlights, exterior illumination can be seen for many miles. Two dozen different color schemes are used for special occasions. Live steam is piped from the basement to huge cauldrons, mounted on the promenade of the tenth floor, and released into the night air, forming white clouds. Into these clouds colored lights are played, producing a very novel effect. Letters in the giant electric sign, San Joaquin Power, are eight feet high, and visible many miles in the fruit-growing districts of California. There are more than six hundred globes in the sign.



Another feature of the new building is the heating, cooling and ventilating system, which is operated from the basement with washed air, passing through clear, fresh water and charged with electricity in violet-ray machines. The advantage of the washed air, it is claimed, is to reduce illness among employees and increase working efficiency. It is said to cure colds and headaches. The washed air is cooled by a refrigerating machine in the summer and heated in the winter. All windows in the building are kept closed the year round, the air being washed and recirculated. Electric Airdry towels, using warm air, are installed in twenty-four locker and wash rooms. From the street to the top of the radio towers, the building is 235 feet in height. The radio towers weigh five tons each and are sixty-five feet high. In construction of the building, two hundred carloads of material were used, including 440 tons of terra cotta, 50 tons of face brick, 6,500 tons of rock, 3,700 tons of sand and 435 tons of reinforcing steel. More than 125,000 feet of lumber was used for concrete forms and 100,000 cubic feet of concrete was poured into these forms.

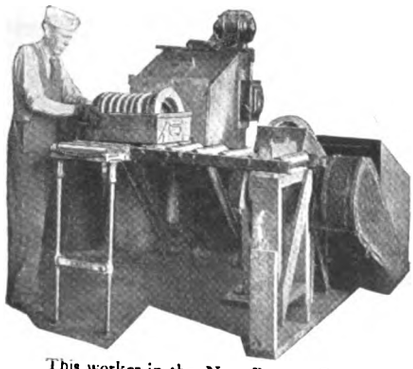
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Do materials flow like this in your plant?

DO porters laboriously push their hand trucks of materials through alleys and runways between buildings? Are there gaps between departments and operations where the production flow halts? Is output reduced and are costs increased because of tangled traffic of parts within your plant?

Many executives have found a study of their material handling to be the foundation of large and unlooked-for economies. By shortening the material flow, and bridging the production-halting gaps with conveyors, hundreds of plant managers have increased their output from the same space and with the same labor—they have reduced overhead expense and cut material handling costs.



This worker in the New Process Gear plant, Syracuse, N. Y., pushes a tote box of gear parts on the conveyor. In a moment it is delivered to the testers on another floor, 400 feet away.

Straight-line production for the scattered plant

Even though your buildings and departments are scattered, you can still have all the advantages and economies of straight-line production. Conveyors bridge the gaps between operations. They carry materials and parts in smooth, continuous flow, regardless of distance.

Oneida Community carries silverware without a scratch between buildings separated by a fifty-foot yard. New Process Gear Company carries tote boxes of gear parts between departments 400 feet apart, and on different floors. And these are only two of the many companies that have profited by straight-line production advantages.

You, too, can have the same advantages. Our new bulletin, "I. S. 15" will tell you how. Its many specific examples of how others have saved by adopting conveyorized handling will suggest easily made economies for your plant. A request will bring a copy to your desk.

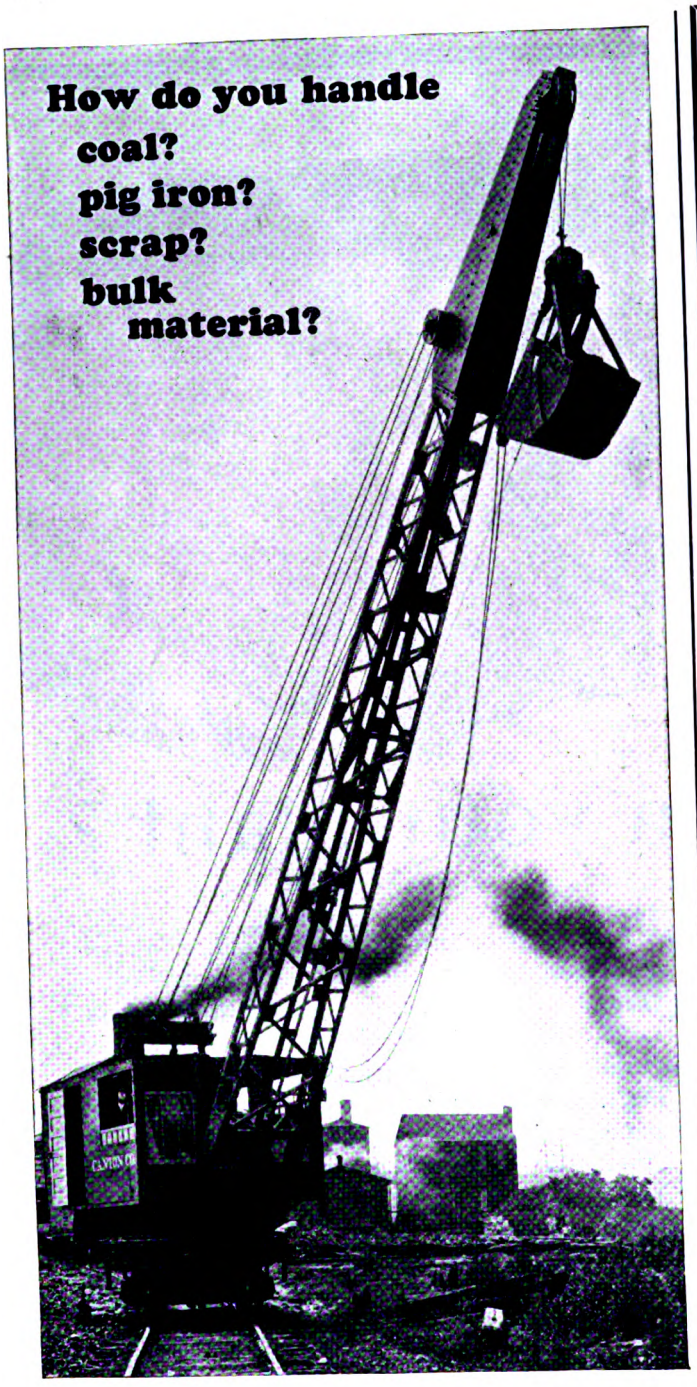
THE LAMSON COMPANY, SYRACUSE, NEW YORK

Branches in all principal cities

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How do you handle
coal?
pig iron?
scrap?
bulk material?



This locomotive crane is adaptable for many kinds of service. Equipped with a grab bucket it handles coal, ashes and other bulk material. With a lifting magnet, it handles pig iron, structural shapes and scrap. With a ball and hook or a fall block, it is used for erecting steel or for any heavy lifting job.

The No. 4 shown here is rated at 20-tons. It has the tractive effort to switch several loaded cars.

Send name and address for bulletins on this crane.

C-4-11

Car Dumpers • Coal Handling Machinery • Clam-shell Buckets

McMyler-Interstate

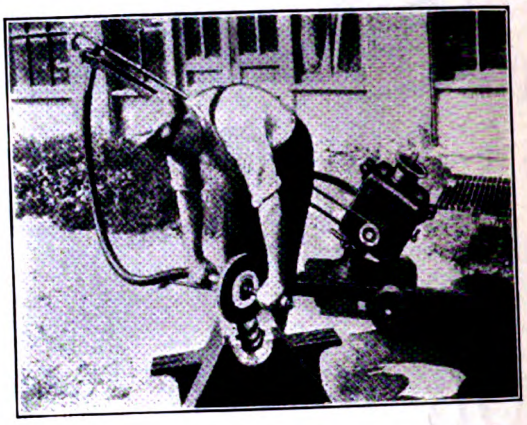
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Grinding, Buffing and Scratch Brush

Built only by

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Binghamton New York

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The work consists of selling subscriptions for one of the best known publications in the industrial field. A magazine published for 34 years with an enviable reputation for its service to industrial executives. Men who can give only a part of their time will also be considered. Write giving an outline of your experience. Address box 535, Care INDUSTRIAL MANAGEMENT, 120 West 32nd Street, New York.

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

Conveying of Orders through Pneumatic Tubes as an aid to many Industries is described in Catalog S-7—and issued by Standard Conveyor Company. See inside front cover.

A Check on Conveyor Weights prevents losses. A new illustrated booklet is now ready. Issued by Merrick Scale Company. Page 2.

Booklets describing conveyors and industrial railways and other equipment for the conveying of coal, ashes and other bulk materials can be obtained from C. W. Hunt Company, Inc. Page 30.

A Vacuum Cleaner for Industrial Plants that has effected savings of thousands of dollars annually is described on page 40. Booklet can be had from Invincible Vacuum Cleaner Mfg. Co.

Protection against Infections among workers is now regarded as a necessity in Industry. See offer by Cresog Laboratories, page 79.

Portable Unloaders. Catalog showing complete line is offered by Chicago Automatic Conveyor Co., page 102.

The Elimination of Glare and Sun's Heat is described on page 58 by The Skybryte Company. See special offer.

Information Concerning the Reduction of Oxygen Costs is shown on page 98. The Keith Dunham Company.

The Construction of the Chain on Yale Chain Blocks is described on page 76. The Yale & Towne Mfg. Co.

Ford Truck Locomotives and Fordson Locomotives are powerful units at comparatively low cost. Complete information from Brookville Truck & Tractor Company. Page 97.

Booklet on Proper Plant Illumination can be obtained from American Fixture Company. See page 75.

A Flexible Industrial Electric Truck is described on page 50 by The Crescent Truck Company. Complete information offered.

Air Hoists for Lifting and Conveying of parts and products is shown on page 85 by Curtis Pneumatic Machinery Co. Catalog and complete information can be obtained from this company.

A Catalog on the Complete Line of Sanitary Drinking Fountains, Bubblers, etc. is offered by Rundle-Spence Mfg. Co. See page 67.

Motors from ½ to 60 hp. are described in Bulletin 28, issued by Century Electric Company. Page 52.

The Booklet, "Safeguarding Industry's Greatest Asset: Man," is offered by the Industrial Glove Corporation. See page 57.

Fractional Horsepower Motors and their applications is included in the Engineering Service given by the Wisconsin Electric Company. Page 73.

Speed Reducer Book No. 26 gives complete information on the better way to transmit power and step down electric motor speed. Issued by W. A. Jones Foundry & Machine Company. Page 32.

Bulletin 229 describes savings effected by the use of underfeed stokers. See page 24. Detroit Stoker Company.

General Catalog No. 28 showing complete line of transmission equipment can be obtained from Pyott Foundry Company. See page 46.

Paints' Relation to Profits is shown by The Nitrose Company. Page 96.

Bulletins on High Speed Cutting Machines are offered by the Racine Tool & Machine Company. Page 106.

Records of quantity production necessary in present day methods, and how they are accurately checked, are described and illustrated in Catalog No. 46. Now ready for distribution by Durant Manufacturing Company. Page 54.

Large Sized Cooling Fans, for foundry, furnace room, drop forge shop, etc. are shown on page 51, by Buffalo Forge Company.

"Quality Facts About Belting" is the title of a series on Better Belting. See page 53. Chas. A. Schieren Company.

Removing Dangerous Fumes and Foul, Impure Air. Literature on this important subject can be obtained from American Blower Company, page 60.

Adjustable Pipe Hangers and their economy are described on page 25. Grennell Company, Inc.

Crane Bulletin No. CE16 describes the gasoline crane for handling coal, ashes and raw materials. See page 94. The Koehring Company.

A Ball-Bearing Loose Pulley for more efficient Transmission is described on page 22. The Fafnir Bearing Company.

The Advantages of the Co-ordination of Parts, Motors and other Accessories for cranes is proven on page 34. Harnischfeger Corporation.

A Catalog which gives examples of Better Handling is offered by the Truscon Steel Company. Page 81.

Seamless Steel Products Company gives an opportunity to try their Kantainers in your own plant. See page 78.

"Coal the Basic Fuel" is the title of a very interesting booklet distributed by the Stoker Manufacturers Association. See page 69.

"Elapsed Time Records" a booklet on keeping time records can be obtained from the Calculagraph Company. Page 54.

The Relation of Quality Drills to Production is described by The Cleveland Twist Drill Company, page 65.

A Blue Printing Machine that Prints, Washes, and completes the entire job in one operation is described in Pamphlet P-28. Page 91. The C. F. Pease Co.

The New complete 1925 Catalog issued by the Easton Car & Construction Company contains the trailers described on page 74.

Automatic Weighing of Materials as a safeguard to Profit See page 56. Toledo Scale Company.

"Mr. Barber's Scrap Book" contains many examples of better handling of materials. See Barber-Greene Company, page 5.

Power Transmission Problems and their solution are described in the Link-Belt General Catalog No. 400. For a copy, see page 43.

The Economical Utilization of Storage Space is the service offered by Durand Steel Locker Company. See page 31.

Details of Pressed Steel Hangers can be obtained from the American Pulley Co. See page 41.

The Observation of Heat-Treating Process Temperatures from anywhere in the plant is shown on page 89. The Motometer Company, Inc.

Information on One-Story Steel Fabricated Buildings all ready for instant erection is offered by Blaw-Knox Company. Page 47.

Valves for Every Requirement are manufactured by the Jenkins Bros. See page 90.

Aid in Choosing the Correct Chain Hoists for every requirement is offered by Wright Manufacturing Company. Page 90.

Complete description of the New Type "R" power electric Hoist can be obtained from Roeper Crane & Hoist Works, Inc. See page 94.

Breakdown Tests that prove the strength of Electric Hoists are described on page 110, by The Euclid Crane & Hoist Co.

$2,841,119,653 is the total Fire Loss since the World War. A means of prevention is shown on page 18. Richards-Wilcox Mfg. Co.

Line Shafting Equipment for every Industrial Need is described in Medart Catalog No. 43. This, together with discount sheet, can be obtained from the Medart Company. See page 49.

Flexible Shaft Tools, motor, belt, or rope driven, for grinding, buffing and polishing operations are described on page 104. These are portable outfits which can find a use in every plant. Made by Stow Company.

The Saving of Cable or Cord Wastage on Cranes is possible through the equipment shown on page 35. Appleton

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Electric Company offers the service of an engineering staff to aid you in this important problem.

Data on Air Hoists can be obtained from Northern Engineering Works. See page 74.

For Information on Chucks for practically every drilling operation, write The Jacobs Manufacturing Company. See page 75.

Sheet Metal Parts and Stampings is a part of the service offered by The Breese Bros. Company. See page 75.

The Reduction of Pulley Centers and its advantages is described in "Saving Slippage and Space," a booklet offered by F. L. Smidth Company. See page 68.

Circulars on the Automatic Regulation of Feed Water can be obtained from the Chaplin-Fulton Mfg. Co. See page 85.

Bulletin I N D shows a complete line of portable tiering machines. See page 98. Revolvator Co.

Saving steam through air and steam tight unions. Catalog offered by E. M. Dart Mfg. Company, page 82.

Facts about Truck Batteries is the information contained in Booklet 1874. Issued by The Electric Storage Battery Company, page 88.

A 225-page illustrated Catalog containing many examples of efficient coal handling is now being sent out by the Cleveland Electric Tramrail Division of The Cleveland Crane and Engineering Co. See page 72.

The Electric Locomotive for Industrial Haulage is illustrated and described on page 109. General Electric Company.

"Rex Chains and Conveyors," is the title of Catalog No. 210. A guide for Chain, Conveying and Transmission Equipment. Offered to engineers, operating men and executives. See page 112. Chain Belt Company.

The wonderful flexibility of the Tier-lift truck is described in "Snap Shots of Sensible Savings." For a copy see page 107. The Lakewood Engineering Co.

Pressed Steel Boxes and Platforms are described on page 106, by Powell Pressed Steel Company.

A working model of a Portable Tiering Machine is offered by Economy Engineering Company. See page 63.

Bulletins describing Vertical and Horizontal Water Tube Boilers. See page 66. The Wickes Boiler Co.

Hyatt Roller Bearings as used on Tiering Machines, both electrical and hand, are illustrated on page 7, by Hyatt Roller Bearing Company.

Standardized Building Construction as the Solution to the Building Problem. Catalog and complete information by Truscon Steel Company. Page 3.

Precision Ball Bearings and Precision Roller Bearings for the freeing of motor troubles can be seen on page 66. Norma-Hoffman Bearings Corporation.

Brooms for Industrial Use with Metal Casing and broad reinforcing band, staple-clinched, are described on page 108, by The Joseph Lay Company. A descriptive price list offered should interest every industrial executive, particularly those in charge of maintenance.

Keeping Dirt and Dust Out of Electrical Equipment is essential to efficient operation. A descriptive folder giving price list of portable electric blowers and testimonials by leading manufacturers is offered by Clements Mfg. Company. Page 42.

A crane that is especially adaptable for handling coal, pig iron, scrap and bulk materials is described in a special bulletin issued by McMyler-Interstate. See page 104.

Conveying Equipment for every conceivable need in industry is described in part on page 38, by The Jeffrey Manufacturing Company. A Complete Service is offered to industry in lower cost handling methods and engineering advice.

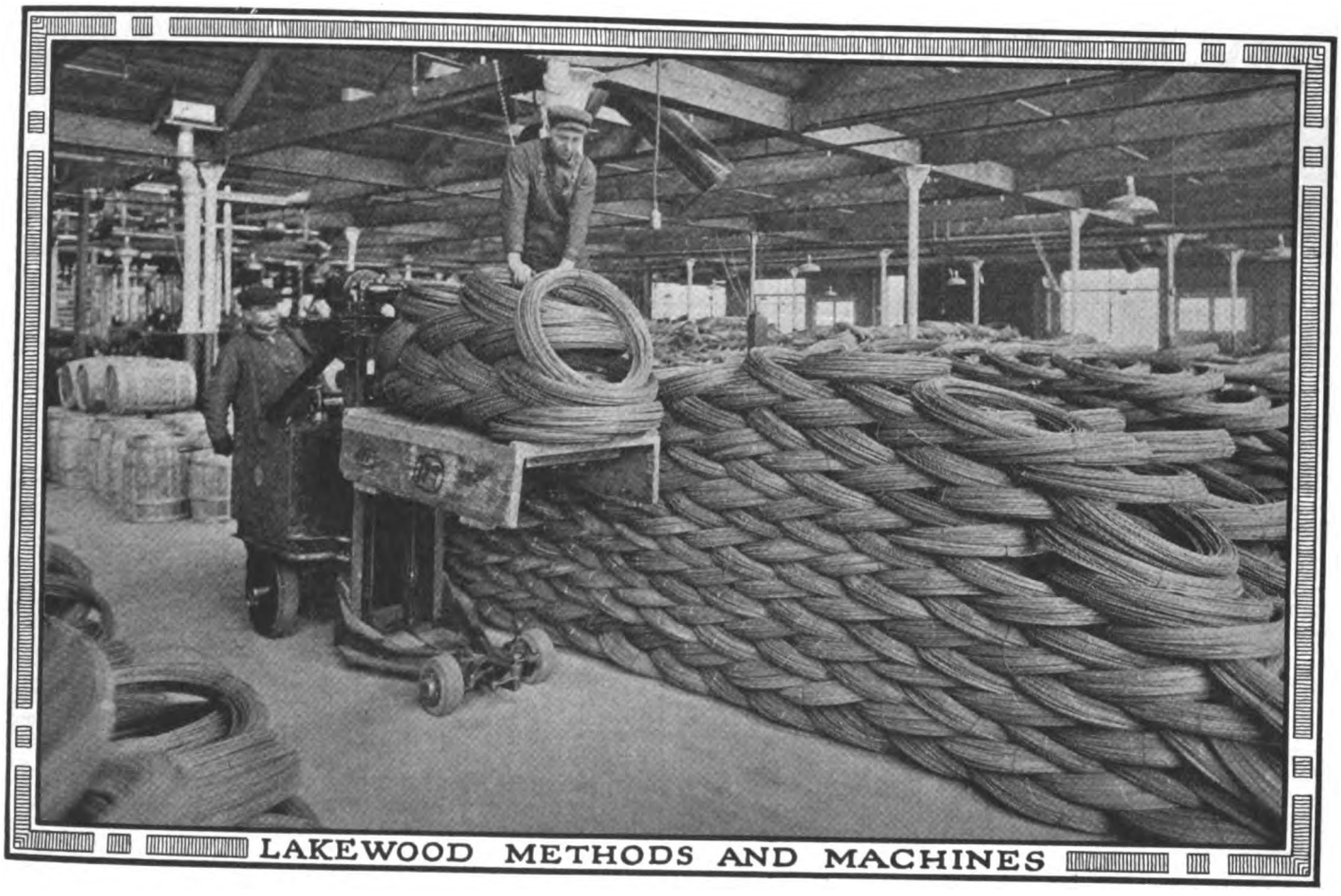
A Man-Cooling Fan for test and trial in your own shop is offered by Robinson Ventilating Company. See page 59. This offer is good during summer months only.

A Blower and Suction Machine Combined is illustrated on page 54. The Martindale Electric Company have a special trial offer on this machine, useful for dozens of jobs in every plant.

Wood Wheels that Save Floors, roll easy and last long; suitable for industrial trucks and trailers are described on page 62, by Metzgar Company, Inc. Full details can be obtained by writing.

A New Electric Rail Crane for Standard Gauge Track is described in Bulletin No. 37. Can be used in steel mill

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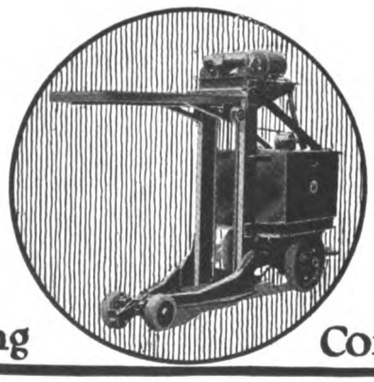
It's the Giant Handy Man Around the Shop

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You, too, can cut costs with Lakewood methods and machines. May we "show" you?

Send for Snap Shots of Sensible Savings.



The Lakewood Engineering Company, Cleveland U.S.A.

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Lay brooms are built of the best, with metal case, broad reinforcing band, staple-clinched, and two sewings of heavy linen twine which hold the extra broad sweeping tip without spread till the broom is worn to the last stub. Write for descriptive price list.

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Save time and money by preventing the hot weather slump in efficiency.

They use less ice per man per season because tank and coil are scientifically designed to supply more men per charge of ice.

They will supply a heavy draft, always ready with no waiting to cool.

They insure clean drinks at all times because the Meeco automatically-regulated bubbler prevents contamination.

They will last for years (many now over 15 years old) because built of best grade materials.

They are easy to install,—direct to municipal water supply.

Their moderate cost, due to quantity production, makes the expense less than you might expect for a product of such real worth.

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Write Today for Catalog and Prices



Fig. 630

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Mfg. Equipment & Engineering Co.
Originators and World's Largest Makers of Ice-Cooled Drinking Fountains
Framingham, Massachusetts

"The Electric Hoist Book," Book of Illustrated Economies describes the ¼, ½ and one ton hoists and their many uses. See Back Cover, Shephard Electric Crane & Hoist Co.

"Getting the Drop on Competition" is the title of a booklet describing up-to-date record systems, and offered by the McCaskey Register Company. See page 6.

The Enormous Waste in Industry Caused by Friction is pictorially told by The Skayef Ball Bearing Company, page 4.

A Return Line Vacuum Heating Pump of simple construction and other trouble-free features is shown on page 10, by Nash Engineering Company.

What Manufacturers Should Know About Gas for heating and process work. See page 48, Smith Gas Engineering Company. A Consulting Service Division for solving industry's gas problems is a special feature of this company.

Information Pertaining to Steel Rolling Doors can be obtained from Cornell Iron Works, Inc. See page 82.

The Advantages of Roller Bearings on Line Shafting can be seen on inside back cover. Hyatt Roller Bearing Company.

Pneumatic Conveying of Materials through a three inch pipe line is described in a special bulletin issued by the Dust Recovering & Conveying Co. See page 20.

Steam Engines that Are Operated with Maximum Economy of oil and steam. See page 70. Troy Engine & Machine Company.

A Diversified Line of Automatic Conveying Equipment is illustrated in a catalog offered by Chicago Automatic Conveyor Company, page 102.

Instruments that control temperature are shown in the Taylor Instrument Company's Catalog. See page 86.

Water Coolers and Drinking Fountains for industrial plants. Interesting information contained in catalog by Mfg. Equipment & Engineering Company. See page 108.

A New 4-Ton Trailer for heavy duty is described in Bulletin A-125, issued by Mercury Manufacturing Company. Page 26.

An Example of Lift-truck Dependability is given on page 64 by Stuebing Truck Company. An opportunity to make a test in your own plant is offered.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 95.

Industrial Truck and Tractor Bulletin No. 26 contains some pertinent facts on industrial transportation. See page 95, The Baker R & L Company.

Straight Line Production, a new method of continuous flow of materials in process is described in the New Bulletin "I. S. 15," issued by the Lamson Company. Page 103.

Products that Lower Maintenance Costs. Protective coatings for all surfaces particularly adapted to the industrial plant are shown in the literature offered by L. Sonneborn Sons, Inc. See page 80.

The High Insulating Properties of MICA and the reason for its use on electric generators is very interestingly described on page 99 by the Westinghouse Electric & Manufacturing Company.

A Standard Metal Office, a standard unit at a low price for a shop office is pictured on page 92 by the Sanymetal Products Co.

Metal Buildings made so that growth can be anticipated and additions made from time to time is shown by Maryland Metal Building Company on page 9.

An Electric Hoist ¼ to ½ Ton Capacity shown on page 83, Reading Chain & Block Corp.

The Announcement of Rubberoid Wheels for Factory Trucks appears on page 36-37, The Bassick Company.

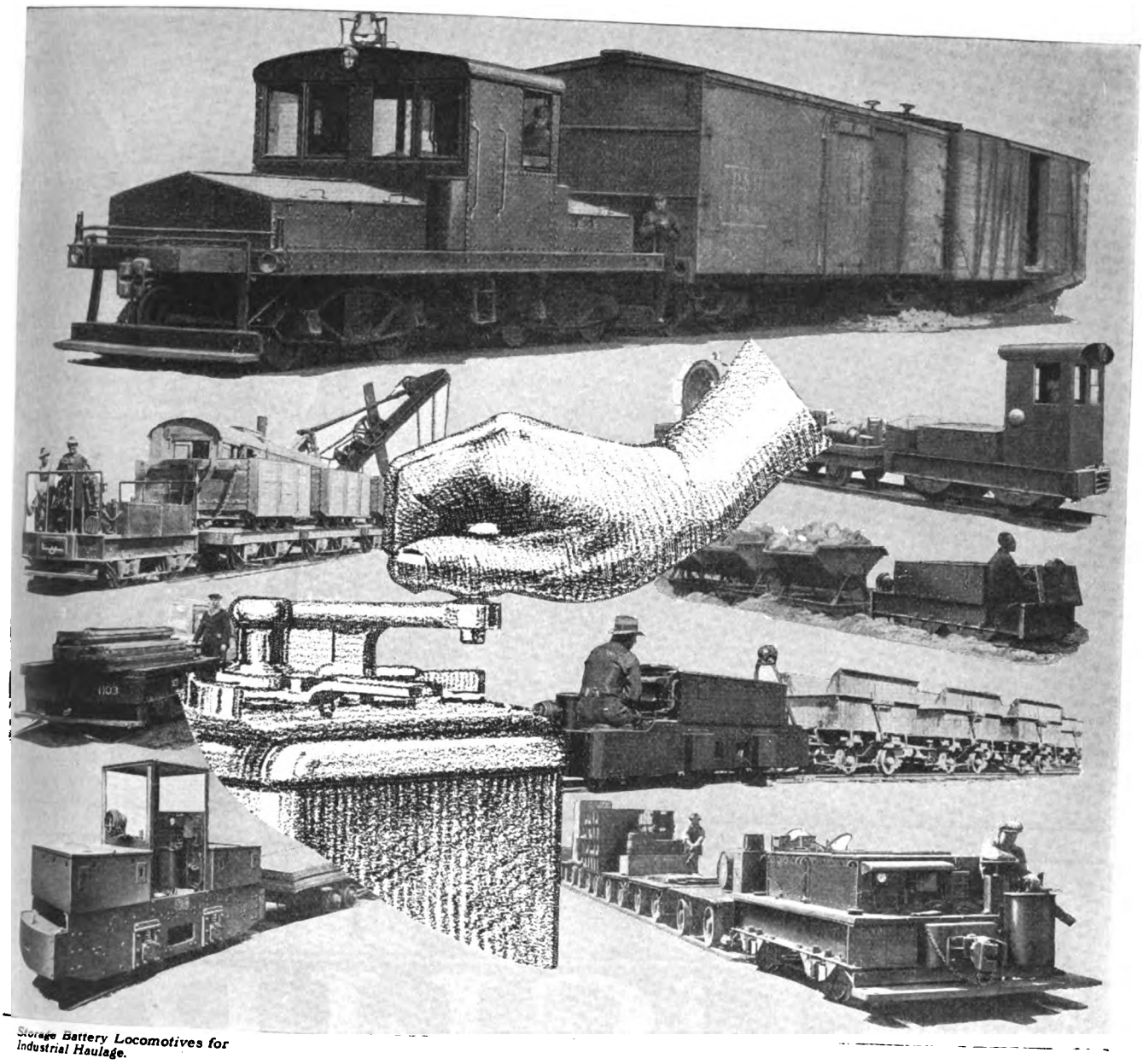
Inclined Slot Conveyors are described by The Dow Company on page 1.

Hand Book of the U-Re-Lite is a book on protection and safe operation of electrical equipment. See page 8, The Cutter Company.

Economics in Coal Handling is the service rendered by Gifford Wood Company. See page 111.

A paper weight for your desk is offered for the asking by Charles Parker Co. See page 67.

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Electric Locomotives are always ready to go

General Electric has been building locomotives for over thirty years in sizes and types to meet all conditions in industry. This experience fits them admirably to take care of your requirements.

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14-8

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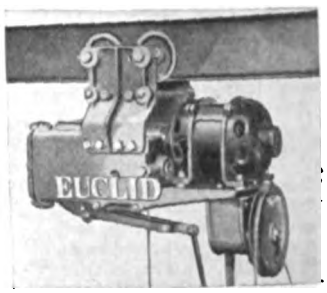
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"RAISE PROFITS"

BREAKDOWN TEST SHOWS EUCLID SUPERIORITY



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"Before standardizing on Euclid hoists we made an exhaustive study and test of practically every electric hoist on the market. One of the tests consisted of operating the hoists three times per minute until failure. On this and other tests Euclid hoists proved superior."

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EUCLID, OHIO

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Transit Lanes *for* Coal that *Save*

AT some plants economy starts at the coal pile. At others it stops there.

Coal handling costs vary from about 50 cents per ton down to 2 cents per ton and even lower.

Do you know how much your coal handling costs? Do your transit lanes for coal waste or save?

Finding out is worth while. It costs nothing and does not obligate you in the slightest. It may point the way to surprising economies—as it has pointed the way for many others.

This is a job for a man who has had years of practical experience in effecting coal handling economies. You will find him at any of the offices below.

Some Plants that Are Saving Now

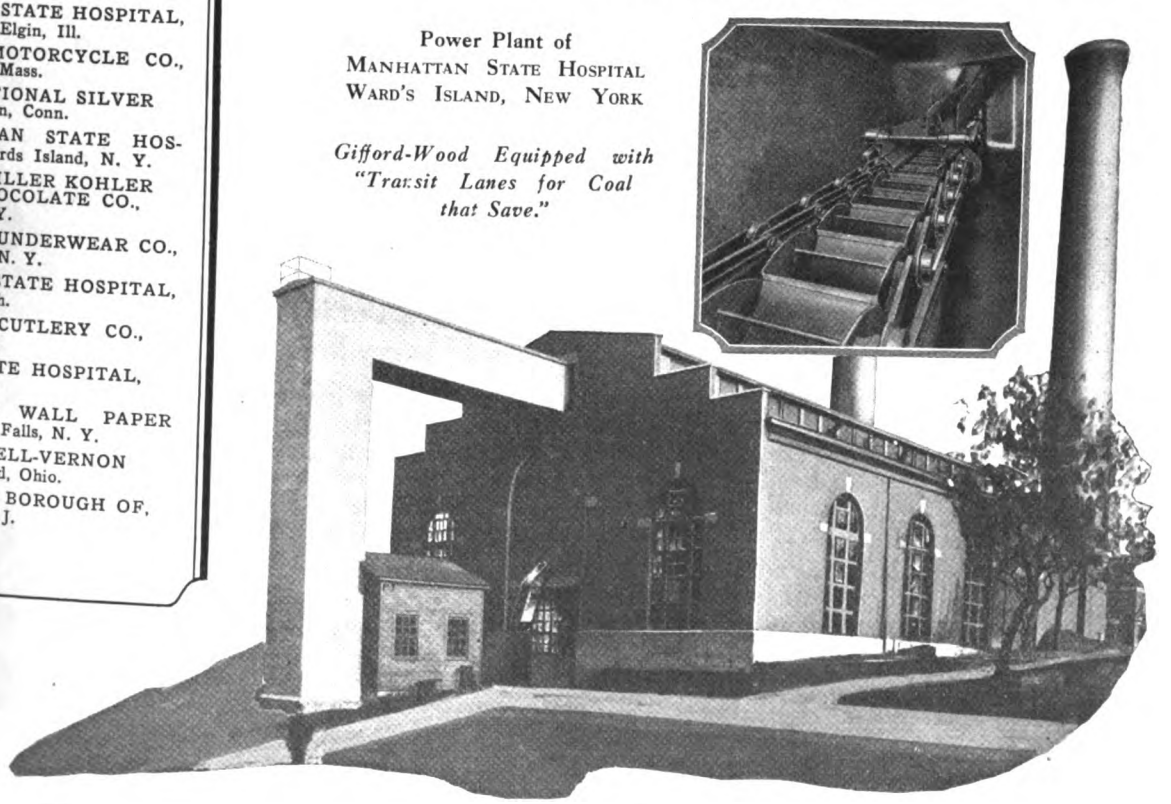
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INDIAN MOTORCYCLE CO., Springfield, Mass.
INTERNATIONAL SILVER CO., Meriden, Conn.
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MANHATTAN STATE HOSPITAL
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Gifford-Wood Equipped with "Transit Lanes for Coal that Save."



Gifford-Wood

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COAL HANDLING EQUIPMENT

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The Rex 210 Catalog and Engineering Handbook



YOU HAVE A FREQUENT NEED FOR THIS BOOK
WHY NOT GET IT FREE?

Why let these questions puzzle you?

These puzzling questions are all covered fully and completely in the Rex 210 Catalog and Engineering Handbook:

Types and application of chains,
Uses of chain drives,
Proper direction of chain travel,
Working loads of chain,
Sprocket types and arrangement. Friction and horsepower, in horizontal, inclined and vertical conveyors,
Friction co-efficient of chain,
Effect of speed on working loads,
Types of conveyors, which to use,
What sprocket for what chain,
Belt power transmission and pulleys,
Gearing, spur gearing, bevel gearing, worm gearing, when to use,
Speed and loads and horsepower of various types of gearing,
Methods of determining shaft sizes, for drives and conveyors,
Clutches, bearings and takeups,
Types of elevators, when to use,
Allowable elevator and conveyor working loads,
Capacities of elevators and conveyors when handling different kinds of materials,
Types of conveyors, for light materials, progressive assemblies, heavy duty, hot materials, sticky materials, etc.,
Coal and ash handling,

And a host of others.

Every day in some plant, often in your own, these questions are puzzling someone. Most any day it may be you. Why not get ready for them by getting acquainted with the Rex 210 Catalog and Engineering Handbook in the meantime? Once you know it, you will find it most useful in your daily work. If you have a copy for yourself and know it well, there will never be any reason for you to waste valuable time hunting for some point of information on chain, conveying or transmission machinery.

This book will give you the information you want—every time

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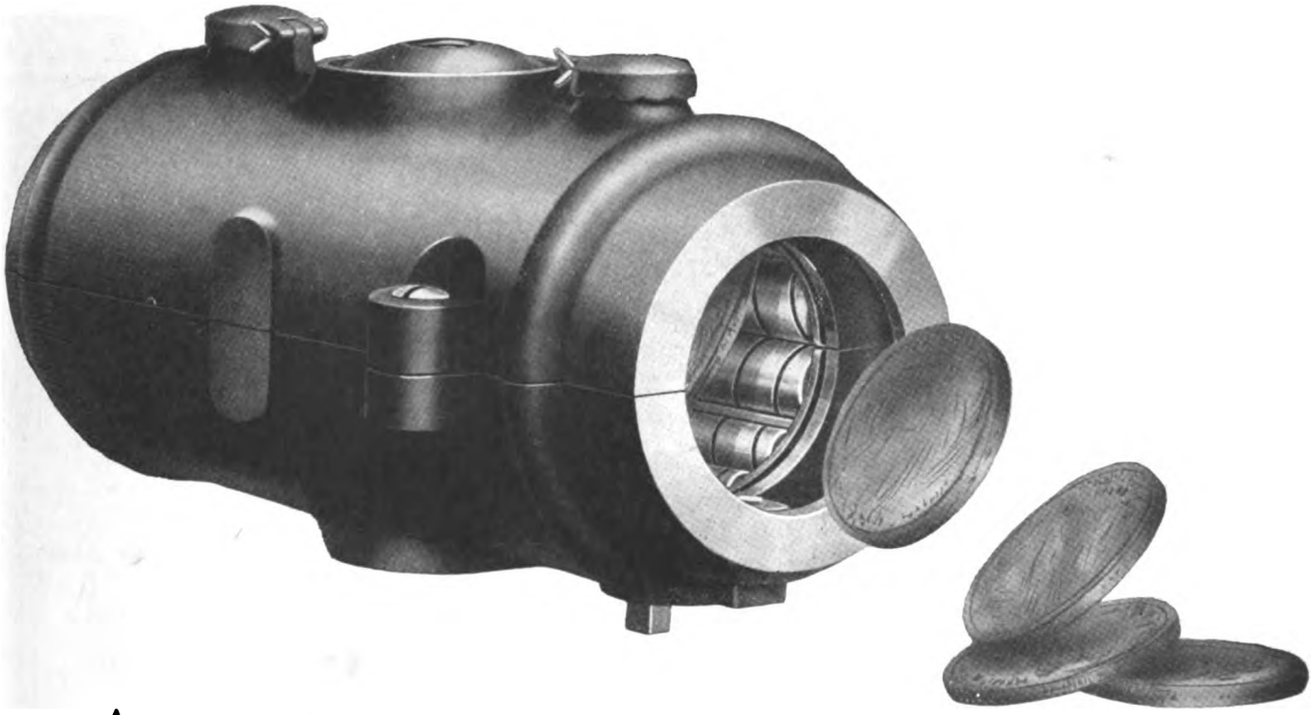
We will send it free to persons in firms using or specifying material as mentioned above. Perhaps you already have this book, perhaps you have seen it on some friend's desk, but you will never know the possibilities of daily use that it holds, until you have used it. It is the guide for Chain, Conveying and Transmission Equipment.

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A steady return on your investment assured with Hyatt line shaft bearings

WITHIN two years of the time of installation, Hyatt line shaft bearings pay for themselves through their economies in power, lubrication and maintenance. After that they yield a steady return on the investment during years of dependable operation.

Mr. H. M. Boyce, *Works Manager of the Morgan-Gardner Electric Co., Chicago, Ill.*, writes:

"The installation of Hyatt line shaft bearings in our plant saved from 10% to 15% of the full power load. Instead of the two engines and two 100 K. W. generators necessary with babbitted bearings, one engine and one generator do the work. From 200 tons our monthly consumption of coal has been reduced to 145, an estimated saving of 55 tons at $7.60 a ton or $418.00 a month."

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The installation of Hyatt line shaft bearings is easily and quickly made, as they are split and can be put on without disturbing other shaft equipment. The upkeep demands are few—just renew the oil three or four times a year. The easy rolling motion and positive lubrication do the rest.

'Phone the nearest mill supply dealer

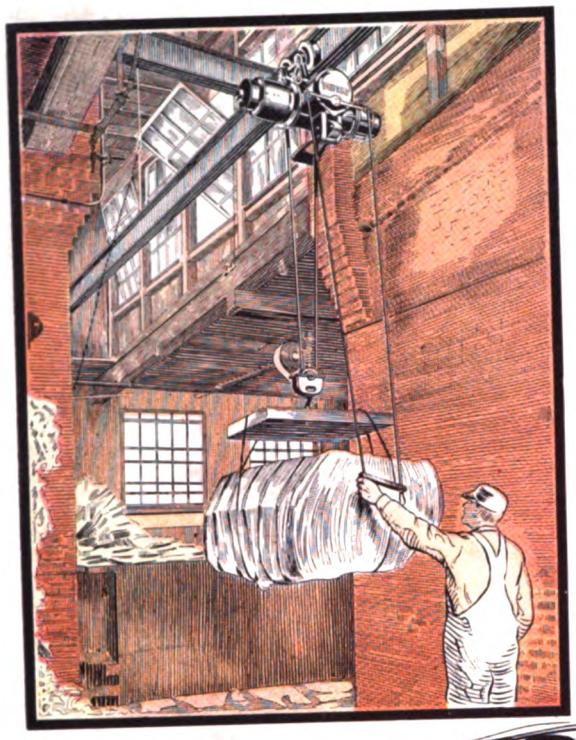
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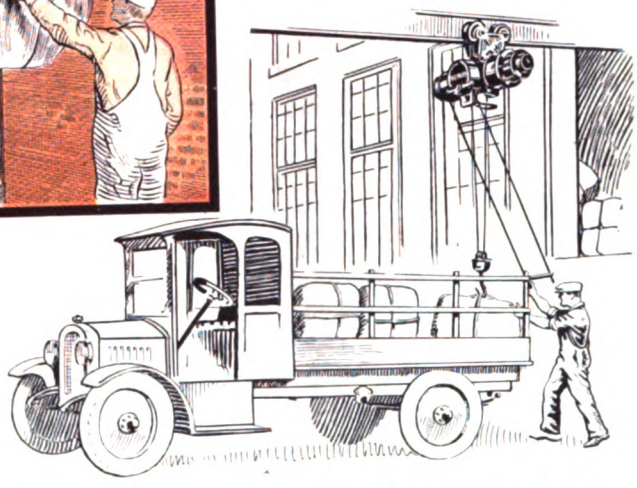
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THE Champion Coated Paper Co., Hamilton, Ohio, uses LiftAbouts and have released $10,000 worth of manual labor for more productive activity. These sturdy little hoists are important factors in keeping production at top notch.

Four handle bales in shredding room, release several men and increase production 30%.

One lifts felt rolls and wire for paper machines in 1/3 the time required by the discarded hand hoist and floor truck method.

The sixth LiftAbout handles rolls of paper to and from calenders—two men do the work of four, and pile rolls four deep instead of two deep, thus increasing storage capacity 100%.

The above plant is typical of hundreds who carry LiftAbout economies to various departments of their business.

Meet the need for strict economy

More and more firms are turning to the LiftAbout as a means of *really* low cost lifting and load-moving. Many of these sturdy little hoists go into service during times like these when every business executive is striving to cut costs.

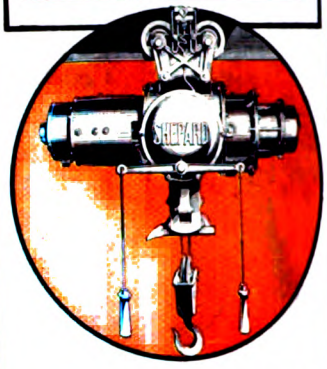
The LiftAbout is furnished in ¼, ½, and 1 ton capacities for alternating or direct current. Its use is so diversified that it is known as "an electric hoist for everybody." Standardized manufacture and quantity production make the price low.

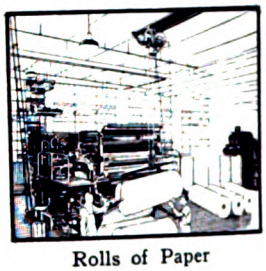
The "Book of Illustrated Economies" shows actual installations and gives figures of actual savings. Send for a copy.

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Branches in Principal Cities
Largest Manufacturer of Electric Hoists in America

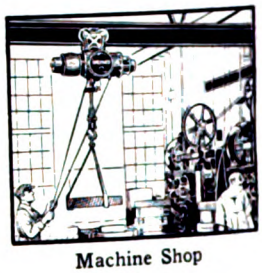
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THE SHEPARD ELECTRIC LIFTABOUT

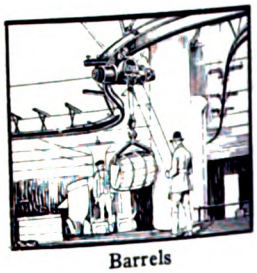




Rolls of Paper



Machine Shop

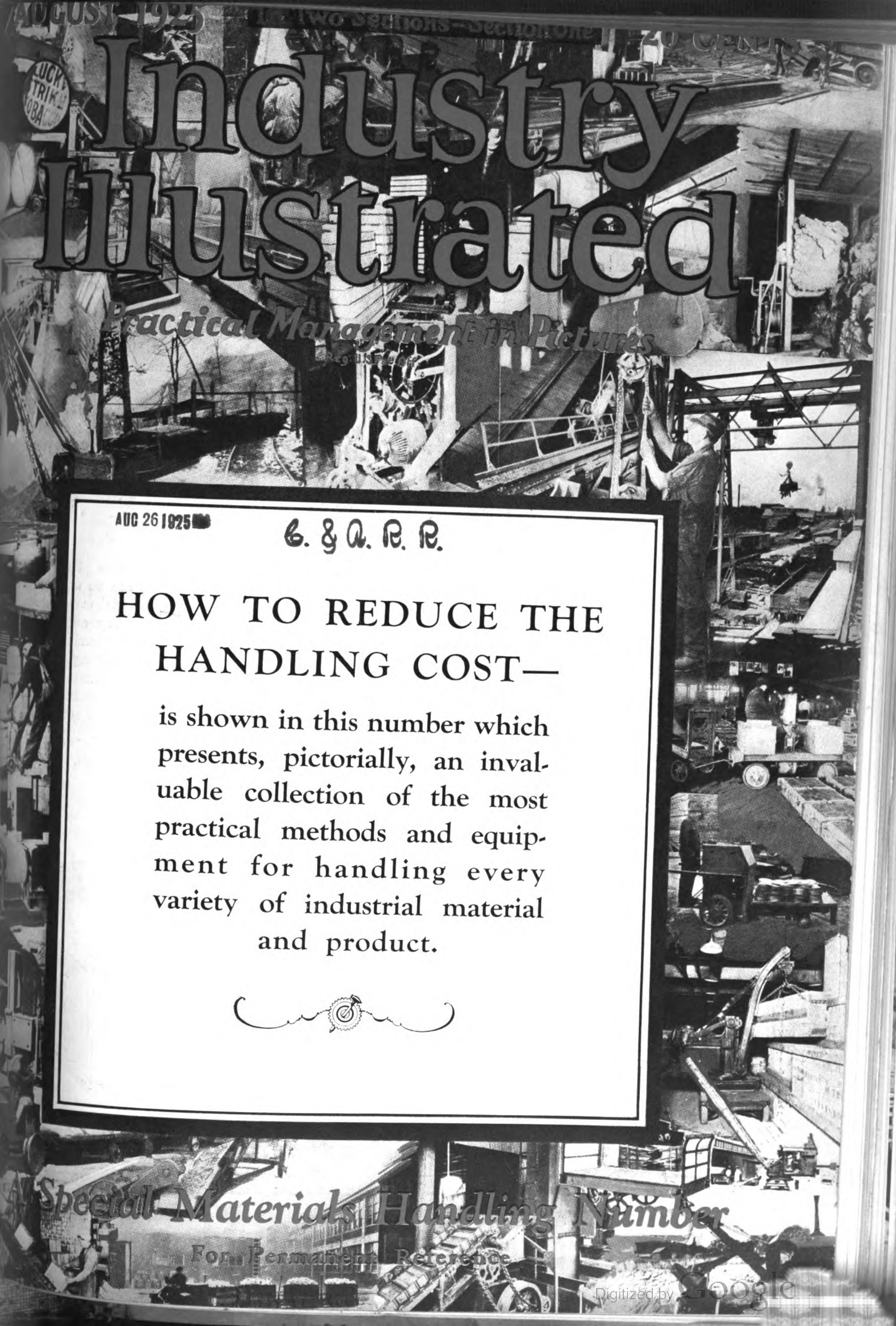


Barrels



Write for—
This 68 Page-Book of Illustrated Economies

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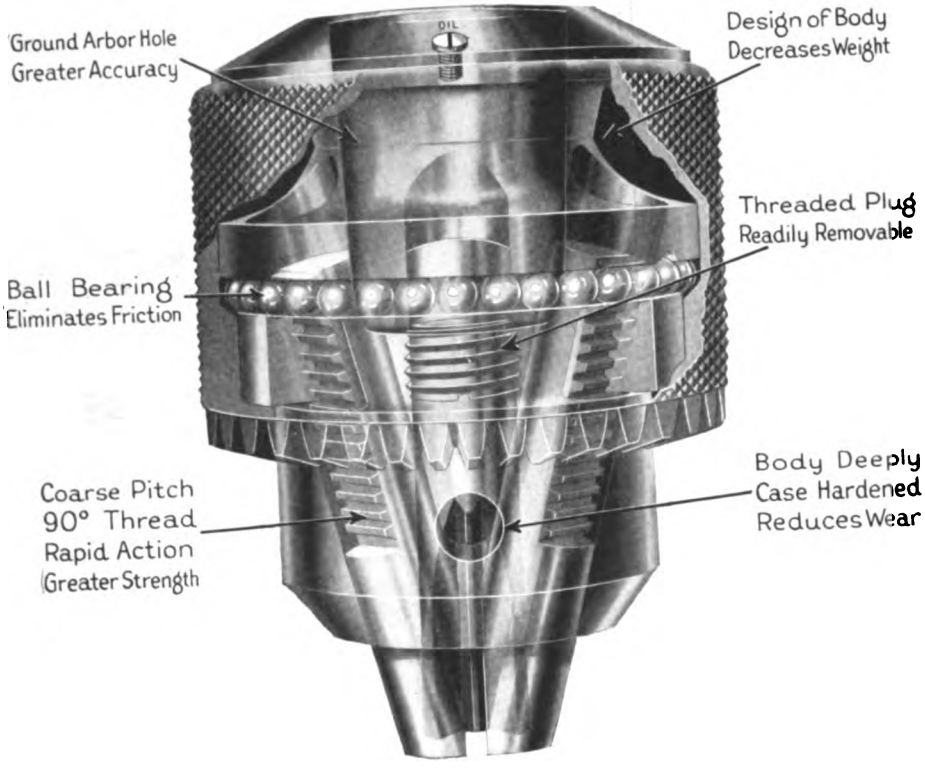
HOW TO REDUCE THE HANDLING COST—

is shown in this number which presents, pictorially, an invaluable collection of the most practical methods and equipment for handling every variety of industrial material and product.

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On 132 makes of drilling machines and portable drills you will find Jacobs Chucks used as standard equipment.

Considering the demand of modern plant officials for continuous production, it is significant that Jacobs Chucks should be the choice of many manufacturers who make products, known for their superior quality and high degree of efficiency.

In your own plant Jacobs Chucks can be used to advantage on many operations. They make better holes and permit of more sensitive drilling. Experience shows that there are fewer broken drills when Jacobs Chucks are used.

Ask your dealer or write us for information.

The New Jacobs Super Chuck

Combines to a heretofore unknown degree—Accuracy—Gripping Power—Ease of Operation and Wearing Quality.



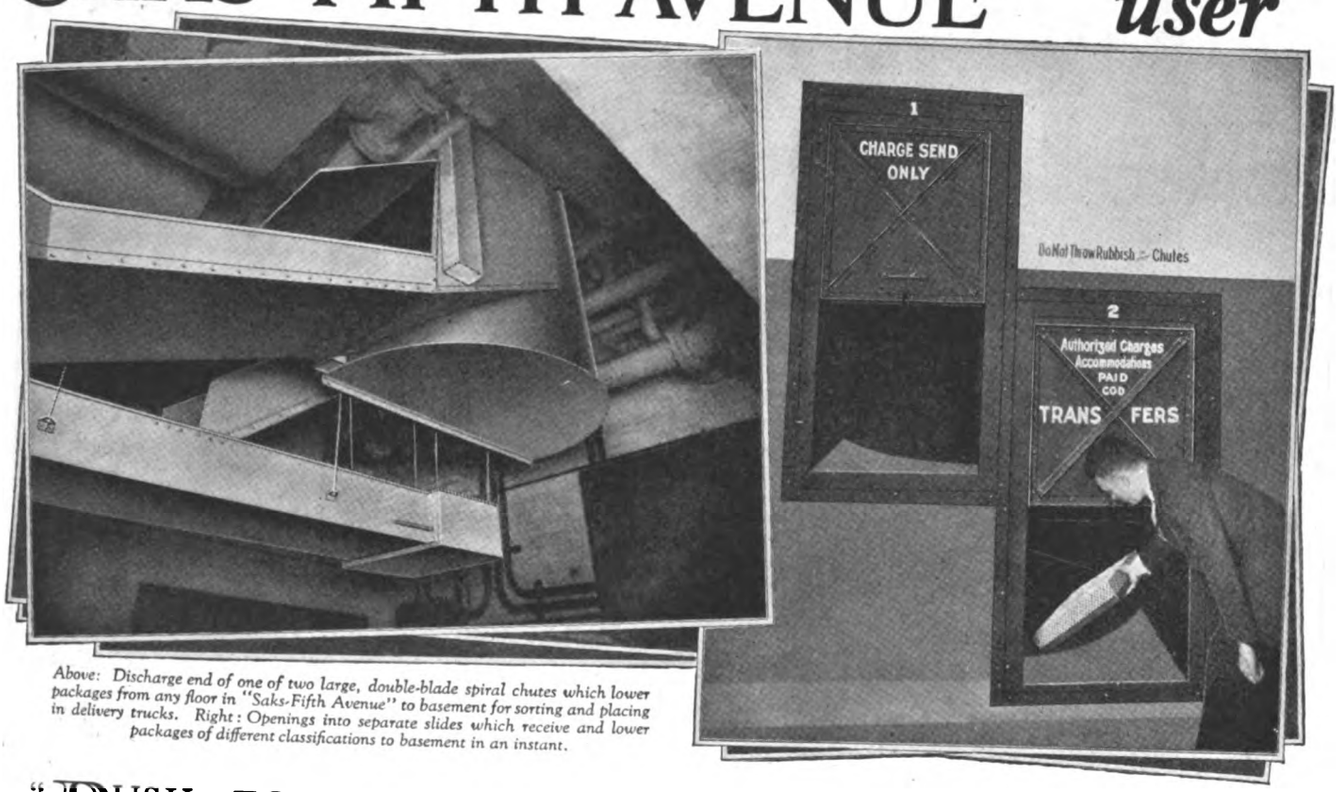
The Jacobs Manufacturing Co.

Hartford, Conn., U. S. A.

The World's Largest Producers of Drill Chucks

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SAKS-FIFTH AVENUE—another user



Above: Discharge end of one of two large, double-blade spiral chutes which lower packages from any floor in "Saks-Fifth Avenue" to basement for sorting and placing in delivery trucks. Right: Openings into separate slides which receive and lower packages of different classifications to basement in an instant.

"RUSH—TODAY—SURE!" One of the mysteries of modern merchandising is the apparent ease with which thousands of articles are each day sold and distributed through our largest retail stores. But the secret is behind the scenes. Take "Saks-Fifth Avenue," for instance. This well-known department store is operating in the largest retail market in the world; unseen but not unappreciated, Dow Conveyors are facilitating the big daily job of distribution, preventing confusion and keeping maintenance costs to the lowest consistent level. Manufacturer or retailer, Dow Conveyors can doubtless do the same for you.



In "Saks-Fifth Avenue," one of the world's representative retail stores, many and varied items of merchandise are dispensed each day with remarkable ease and accuracy. Retailers and manufacturers alike are finding Dow Conveyors essential allies in multiplying man power, facilitating effort and keeping operating costs to the minimum.

Logan Co.

Formerly THE DOW CO., *Louisville, Ky.*

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Detroit Office, 8855 Woodward Ave. Kansas City Office, North Kansas City
Indianapolis Office, 425 Board of Trade Bldg. Philadelphia Office, 605 Fox Bldg.
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It is Human to Err—

but it's costly to neglect!

You cannot expect too much from the human element. When your workmen make mistakes in the keeping of time cards with the old-fashioned pencil method, do not judge them too harshly.

It is partly the factory executive's fault for not providing employees with a safe and fool-proof system of timekeeping—a method of utmost accuracy.

Install a Calculagraph and note the profitable change! Calculagraph *prints the exact total of the time elapsed*, and also records the beginning and end of each job. Our booklet, "Elapsed Time Records," contains interesting data on timekeeping problems. Free on request.

THE CALCULAGRAPH COMPANY

54 Church Street **New York City**

CALCULAGRAPH

The Elapsed Time Recorder

The Publisher's Column

Allies in the War on Waste

In warfare, each branch of service is interrelated. One depends upon the others. No one stands upon its own feet.

Infantry looks to Artillery for support. Both in turn depend upon the Service of Supply.

The key-note of the Service of Supply is Transportation. Today's wars are lost or won according to the efficiency with which men, munitions and materials are moved.

In the great war on industrial waste, the industrial Service of Supply is a vital factor. Its key-note is transportation. We call it "Materials Handling."

Production operations are dependent, for their efficiency, upon this industrial service of supply, which in turn depends primarily upon Power for its operation.

All of the waste reducing branches of industrial service are related as to effect. What benefits one will help another.

No executive can make an intelligent study of materials handling, in his own plant, without finding ways to better his production processes. Speed in one branch demands speed in another.

No executive can make an intelligent study of this industrial Service of Supply without keenly realizing the primary importance of efficient power plant operation, or power supply. Speed demands power.

We believe that the careful study of this issue, primarily devoted to the industrial "Service of Supply," will also be the means of stimulating better production methods, better use of power, better coordination of management—and more profits.

Industry Illustrated

Published Monthly by

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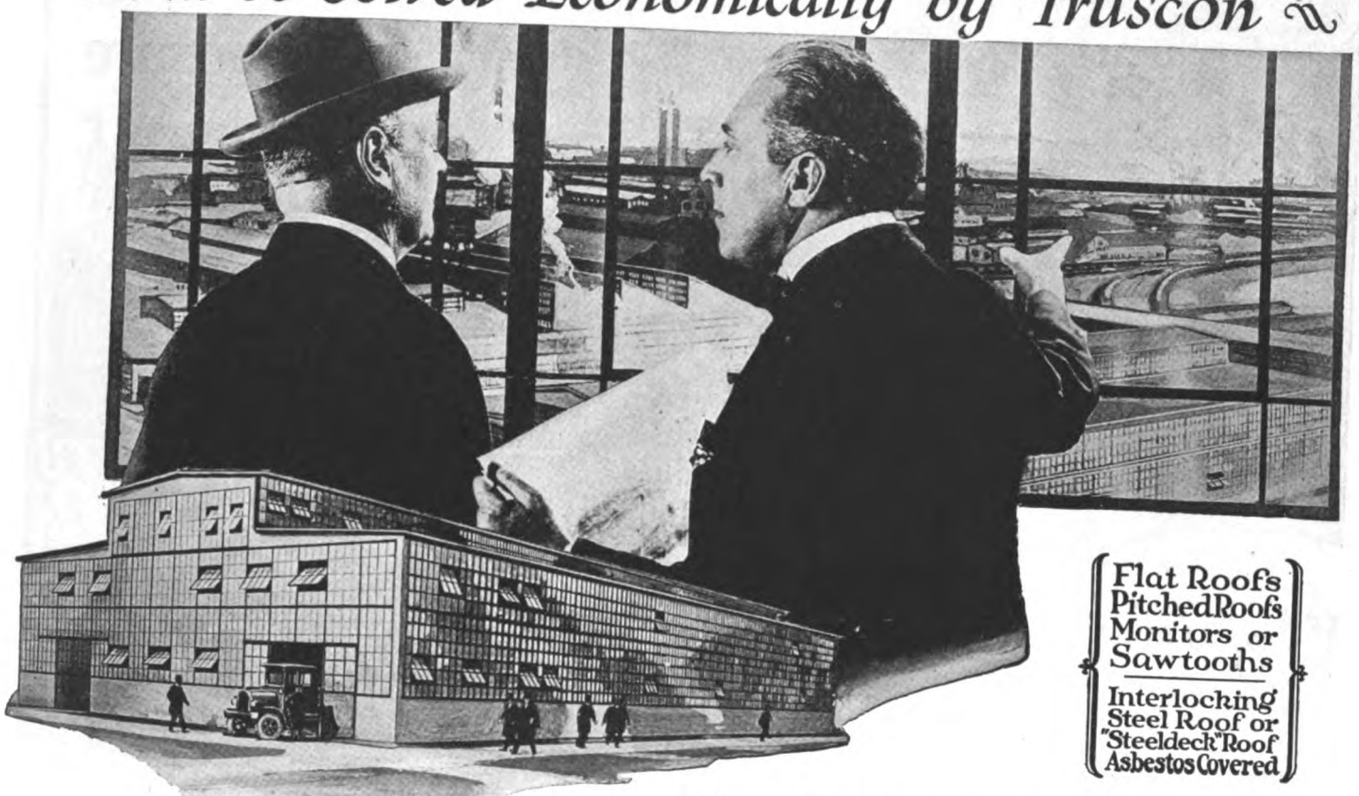
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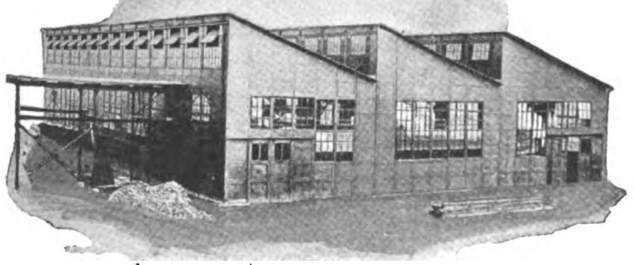
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Can be Solved Economically by Truscon



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Pitched Roofs
Monitors or Sawtooths

Interlocking Steel Roof or "Steeldeck" Roof Asbestos Covered



PRACTICALLY every housing need in industry can be met by Truscon through its standardization of the units from which Truscon Standard Buildings are constructed. Truscon standardization allows maximum flexibility in adapting structure to owners' needs.

Your special problem put up to Truscon's skilled engineers will bring you suggestions and estimates entirely without obligation to you. Design, estimate, manufacture and erection are all parts of Truscon Service to you. You are relieved of responsibility and assured a building right in every respect.

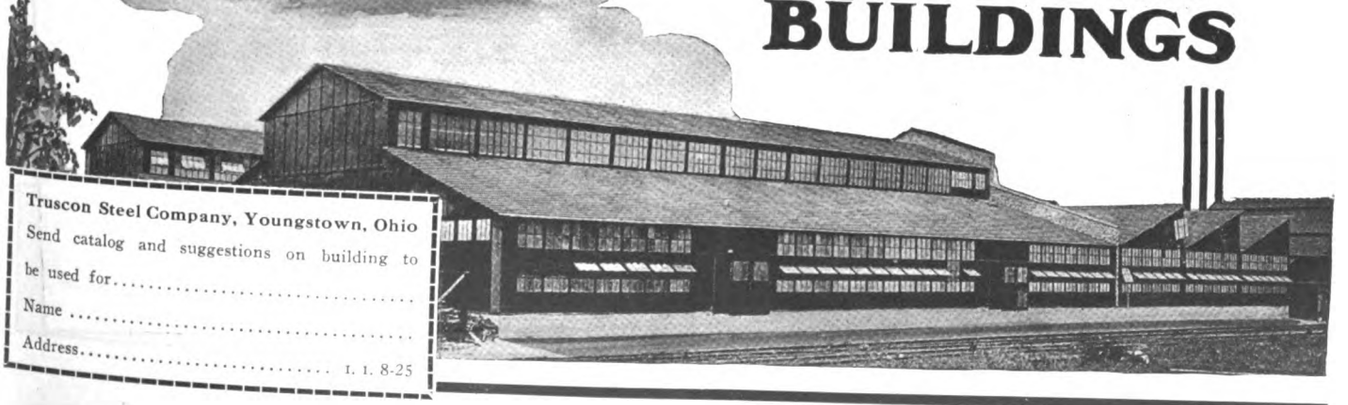
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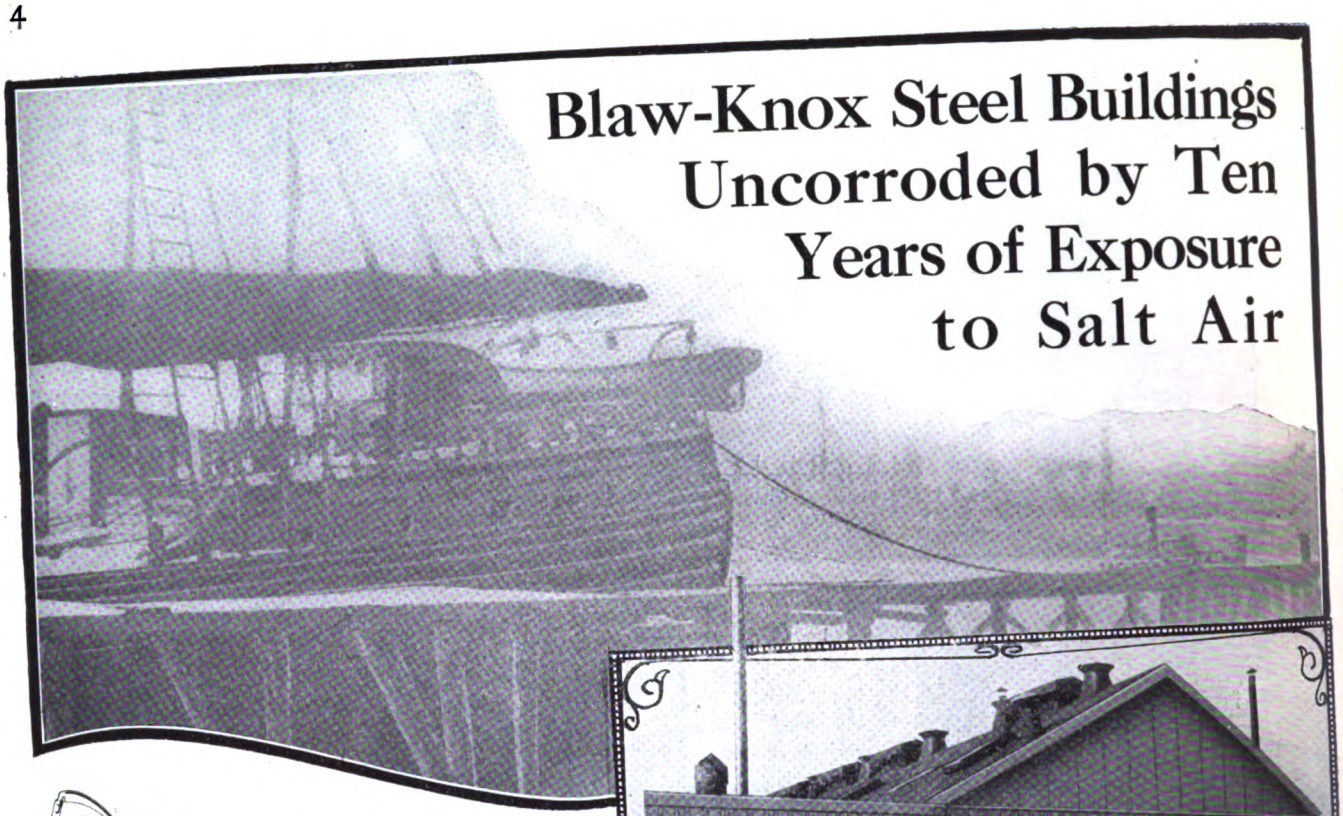
TRUSCON STANDARD BUILDINGS

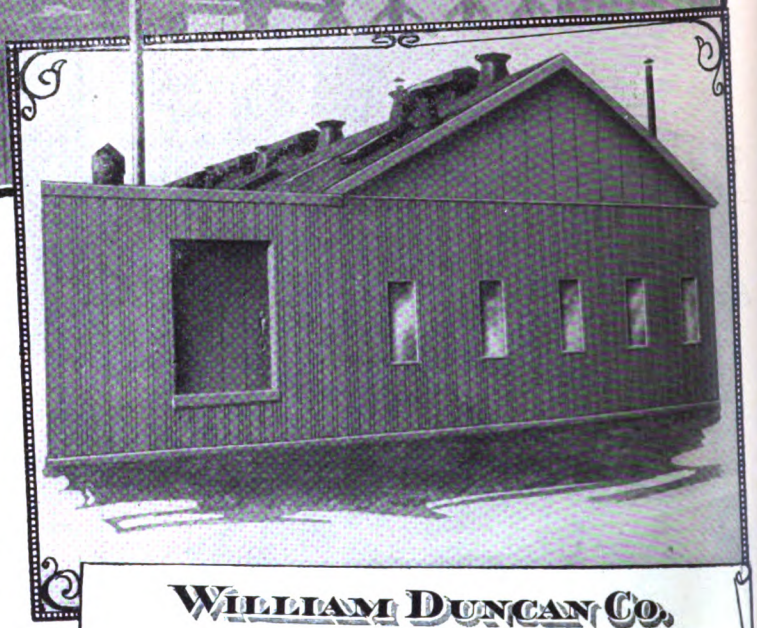


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Address..... I. I. 8-25

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Blaw-Knox Steel Buildings Uncorroded by Ten Years of Exposure to Salt Air







THERE is a well-defined desire among business men to get at the bottom of this subject of steel buildings. How long will an all-steel building resist corrosion? Can it be made leak-proof? How does it stand up under the action of acid fumes and salt spray? These, and many more questions are asked of us by industrial executives who want proof of endurance and satisfaction under *all* conditions of service.

The Blaw-Knox steel building is the only design on the market today which presents a convincing record to the conservative builder. Through a period of forty-four years it has literally withstood the acid test—of industrial requirements.

The record of the William Duncan building is typical of the continued satisfaction met with in hundreds of early installations. All these records are open for your inspection. They are the buildings themselves—still in service—dotted here and there about the country where you can see them and form your own conclusions as to their endurance and value.

By test and comparison Blaw-Knox holds undisputed leadership where firesafe, one-story, ready-to-erect buildings of highest quality at low cost and low upkeep are desired.

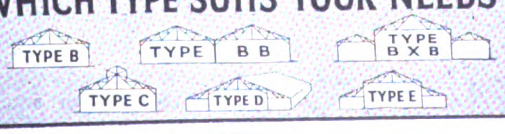
The Blaw-Knox steel building is completely shop-built from standard sections and partially assembled, ready to erect. We meet your specifications as to type, size, windows, doors, skylights, ventilators, etc. Only one order to sign—immediate shipment and speedy erection guaranteed. Send for complete details and prices.

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WHICH TYPE SUITS YOUR NEEDS?



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BRASS FOUNDERS
BRONZE AND ALUMINUM CASTINGS
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East Boston, Mass.

Feb. 5, 1925

Blaw-Knox Company,
Pittsburgh, Pennsylvania.

Gentlemen: Relative to the steel building which we purchased in 1915, we are pleased to submit the following facts which led us to our selection of this building and our opinion as to its durability. We had owned the land at our present location for some years, but owing to the stringent building laws and the nature of the soil, which is filled land, we were unable to consider the erection of a building which would meet our needs as the cost would be prohibitive.

At the Auto Show we saw a model of a steel building of your design and decided that at last we had found what we wanted at a price which, including the cost of furnace settings, stack, brick floor, etc., was equivalent to about three years' rent which we had paid in our old location. We immediately purchased one of these buildings and erected it ourselves.

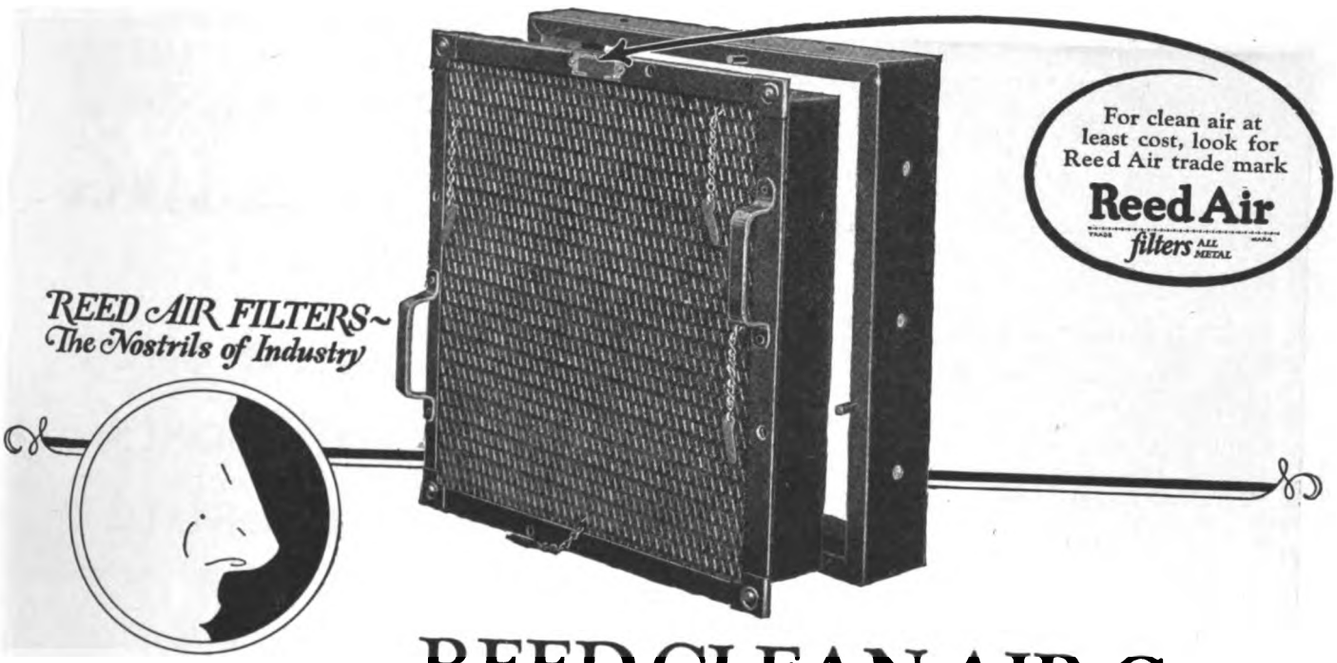
The building is located less than a stone's throw from salt water, but there is no sign of corrosion even though it is now in its eleventh year of service. It has been painted only twice and is just as good as when it was erected. We have enlarged our plant considerably since that time, the following year erecting a building of another make employing steel sheeting protected by a patented cover. This building, however, does not begin to compare with your design and the steel sheeting beneath the patented cover has corroded under the action of salt air.

We can cheerfully recommend buildings of your design as they should appeal to anyone wishing a serviceable and inexpensive building.

Very truly yours,

WILLIAM DUNCAN CO

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INDUSTRY must breathe air free from dust and bacteria. Plants must be ventilated. Machinery must be cooled. Drying processes must be carried on. A Reed Air Filter in the intake of the ventilating system serves, with higher efficiency, the same purpose as the nostril in the human breathing system. It removes by impingement dust, soot and other impurities from the air. Send for any of the bulletins offered below.

REED CLEAN AIR Costs 20% Less—Tests Show

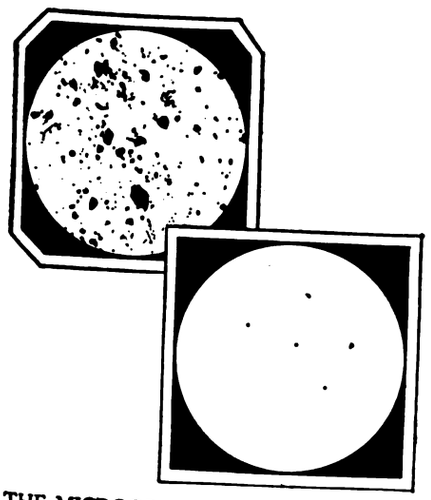
THE BRIDGES ART MUSEUM, of San Diego, California, recently conducted comparative tests to enable them to obtain the air filter possessing the highest degree of efficiency.

The Reed Air Filter was selected — three points of its superiority being:

[1] Consistently higher efficiency in dust removal
[2] 33⅓% more air at same resistance
[3] 40% less resistance at same capacity

Conclusive evidence, therefore, that by the use of Reed Air Filters you obtain *cleaner air at less cost*— for the reduced resistance in Reed equipment represents savings of 20% to 25% in the power required to operate the blower.

Send for any or all of the bulletins offered below. Know how easily and economically Reed Air Filters can be installed in any plant, old or new.



THE MICROGRAPH on the left shows the objectionable content of ordinary city air. The micrograph at the right shows the result after this air has passed through a Reed Air Filter. Over 97% of the dust, soot and bacteria has been removed.

REED AIR FILTER COMPANY, *Incorporated*
211 Central Avenue, Louisville, Kentucky
Offices in Principal Cities

Reed Air
TRADE *filters* ALL METAL MARK

SEND for the free bulletins that interest you: No. 106 — How Reed Air Filters Work. No. 107— Data, Tests and Specifications. No. 108—For General Ventilation. No. 109—For Electrical Ventilation. No. 110—For Air Compressors, Combustion Engines and Pneumatic Equipment. No. 111—For Drying Operations and Bacteria Control. Special Bulletins on Recovery of Valuable Dusts and Control of Injurious and Explosive Dusts.

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have slashed the production costs by increasing the output and reducing labor turnover for hundreds of manufacturing plants where heat is used

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Accept this Free Offer

As a special inducement, during the warm weather we will ship Robinson Man-Kooling Fans on approval for test purposes in your own plant.

When wiring or writing, state size (24″ 36″ or 42″); also voltage, (phase, and cycle); current (A. C. or D. C.)

Robinson Ventilating Co.

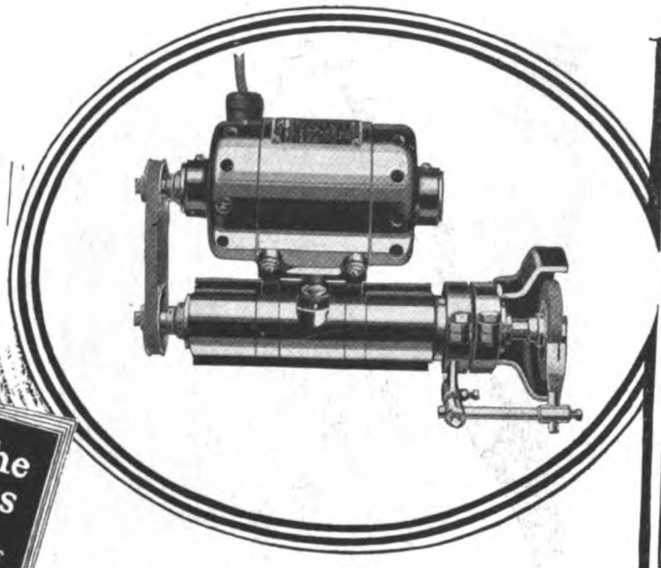
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House Building

Pittsburgh, Pa.

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Dumore No. 3—Multi-Speed Grinder

This Book Shows Grinding Stunts that Cut Costs

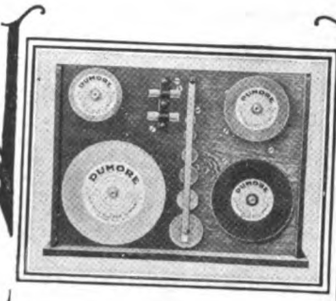
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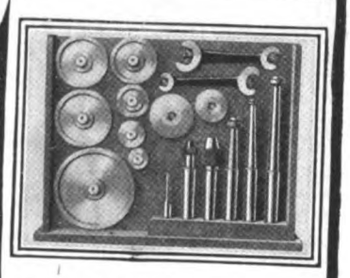
CHUCK full of time and money-saving suggestions — containing actual photographs of grinding set-ups that have cut costs for others—showing how efficiently Dumore grinders do "the jobs that can't be done," our new book, "Hitting the High Spots," will prove mighty interesting to the man who likes to do good work—*quickly* and *economically*.

Regardless of the kind of work you do—irrespective of the nature of your business, if you maintain a tool-room or machine shop you'll find this book a real help in unsnarling those "stump" problems that come up so often. And all these valuable hints are free for the asking. Just fill out and send us the handy coupon below. Your copy of "Hitting the High Spots" will be sent by return mail. But start the coupon on its way today. The books are going fast!

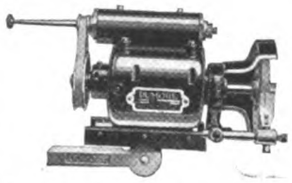
A Few Dumore Grinder Advantages

Six distinct styles of Dumore grinders, each with individual speed ranges, provide a grinder with the correct cutting speed for any grinding need. Dynamically balanced armatures and selected ball bearings in Dumore grinder motors eliminate vibration—permitting maintenance of grinding limits as close as .0001, without taper, bell-mouth or chatter marks. Operating on alternating or direct current, these sturdy grinders are especially useful in shops supplied with two varieties of power current. Easily portable, they save the cost of tearing down expensive set-ups.





Wheel & Spindle Equipment Furnished with Dumore No. 3 Multi-Speed Grinder



Dumore No. 2—AG Grinder

For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R. P. M. Self aligning ball bearings. Comes completely equipped.



Dumore No. 1—JG Grinder

An inexpensive tool for garage, repair shop or tool-room. Speed 15,000 R. P. M. Length of arm 4¼". Extension spindle 2". Grinder pivots on base.

WISCONSIN ELECTRIC COMPANY, No. 70, 16th St., RACINE, WIS.

DUMORE

HIGH SPEED GRINDERS

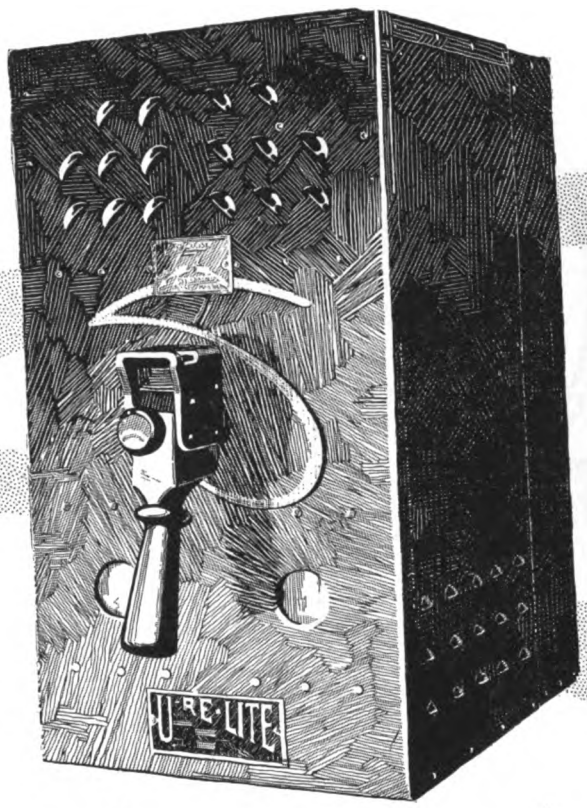


Wisconsin Electric Company
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By way of comparison—

when a fuse blows

—the program is about like this: First find the electrician, then have him locate the burnt out fuse; next, find another fuse of appropriate size for replacement; then secure the proper tools, remove the spent fuse, and finally put in the new one. And during all this time machinery is stopped—hands are idle—production is at a standstill.

U·RE·LITE

—the procedure is different: An overload or short circuit trips it open. To restore service just turn the handle on the FRONT OF THE BOX. No electrician required—anyone can do it. Service is instantly resumed without interruption in production, without danger to the operator, and with no lost time.

U-Re-Lite, once set, cannot be tampered with by irresponsible parties. Its steel box is locked by the man in charge. It is absolutely *fool-proof*.

A line addressed to the Cutter Engineers will bring you, without charge, a fully illustrated, completely detailed Handbook on Electrical Protection, containing valuable data based on 36 years' experience in the electrical and manufacturing field.

U-Re-Lite is positive and infallible in its action—it is beyond the effect of the "human element." The switch members can't be held in against an overload or "short." Its steel case protects workers from contact with live parts.

Only the finest materials go into its construction—it is of very sturdy and rugged design. U-Re-Lite will last a lifetime—no "renewal" expense.

The famous "Cutter Curve" trade-mark on the steel box signifies:

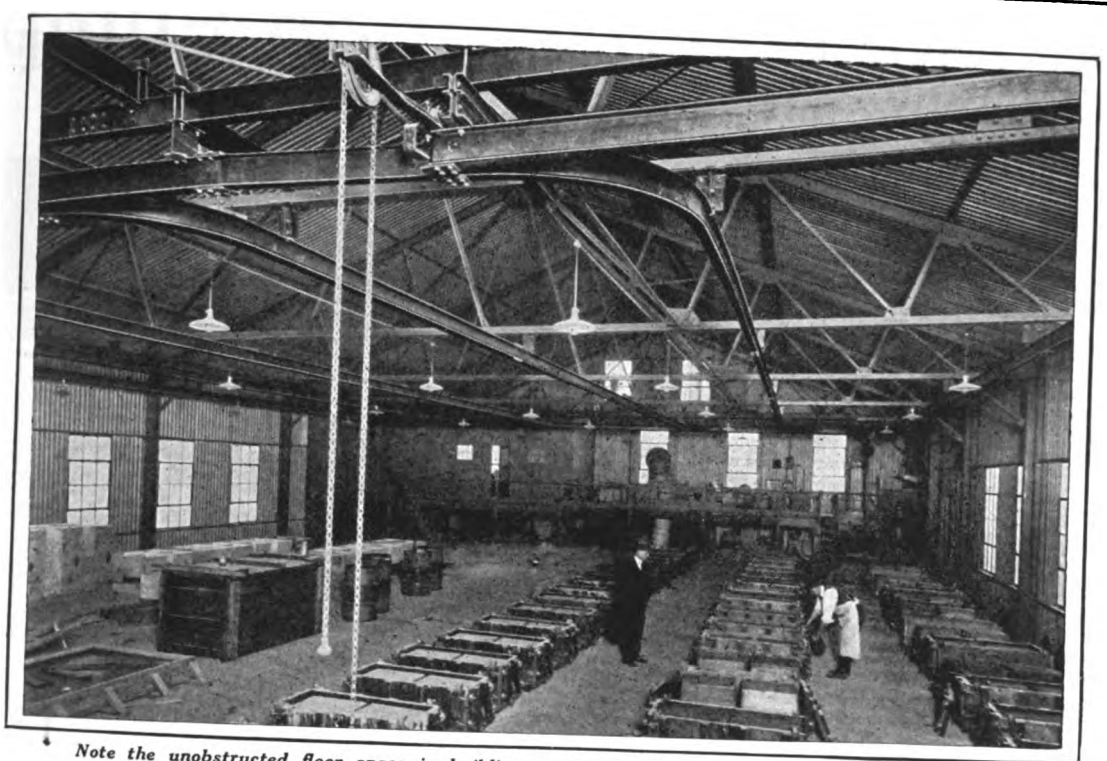
First to the left,
Then to the right,
Turn the handle
and
U·RE·LITE

THE CUTTER COMPANY, Philadelphia
501 NORTH 19th STREET

CUTTER

K **U-RE-LITE** ☞ ☞ ☞ **I-T-E CIRCUIT BREAKERS**

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Note the unobstructed floor space in building erected for Soapstone Products Co. Grassland, Pa.

No Posts—No Obstructions

—*Ideal for Material Handling Equipment*

ONE of the outstanding advantages of Maryland Metal Buildings is that they have no center columns, posts, or other obstructions to interfere with the operation of material handling equipment. Conveyors, tiering machines, trailers, trucks, and tractors, operate with perfect freedom. You can arrange your machinery, route your work, just as you wish without the worry of obstructions.

Easy to Enlarge Building as You Grow

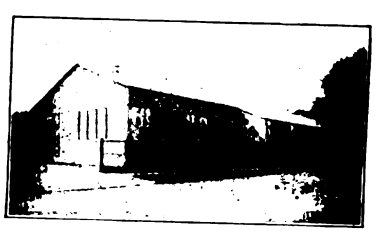
It is a simple matter to add to the floor space of a Maryland Metal Building at any time. By extending the steel framework on the sides, additional floor space may be secured at very little extra cost. This feature alone may save you hundreds of dollars.

The fabricated steel frame and patented interlocking sectional construction, insures strength, rigidity, and complete protection from wind and rain. Lyonore Metal, of which all Maryland Metal Buildings are made, is absolutely lightning proof, fire and rust resisting. In fact, tests prove that Lyonore Metal will outwear steel or the so-called "irons" many times.

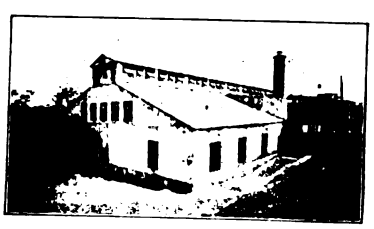
No Unnecessary Expense

Maryland Metal Buildings may be erected in a surprisingly short time. The various units are made so that they fit perfectly. No skilled mechanics needed. With our easy-to-understand instructions your ordinary help can erect a Maryland Metal Building quickly and without any unnecessary expense.

Are you planning on putting up a new building? No matter what it is for—a manufacturing plant, warehouse, repair shop, garage, boiler house, watchmens booth, etc. —investigate the Maryland Metal Buildings. We guarantee to supply a building at a lower cost per square foot of floor space than any other type of permanent construction.



A typical industrial building.



A Monitor Type Building

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By all means consider the savings to be made by using Maryland Metal Buildings. Write for our catalog. It pictures all types of buildings and gives complete information. No obligations. Simply mail the coupon.

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Baltimore, Maryland

Please send us a copy of your catalog. We are interested in a building, size .....x....., to be used as ..... What would such a building cost?
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Name _____

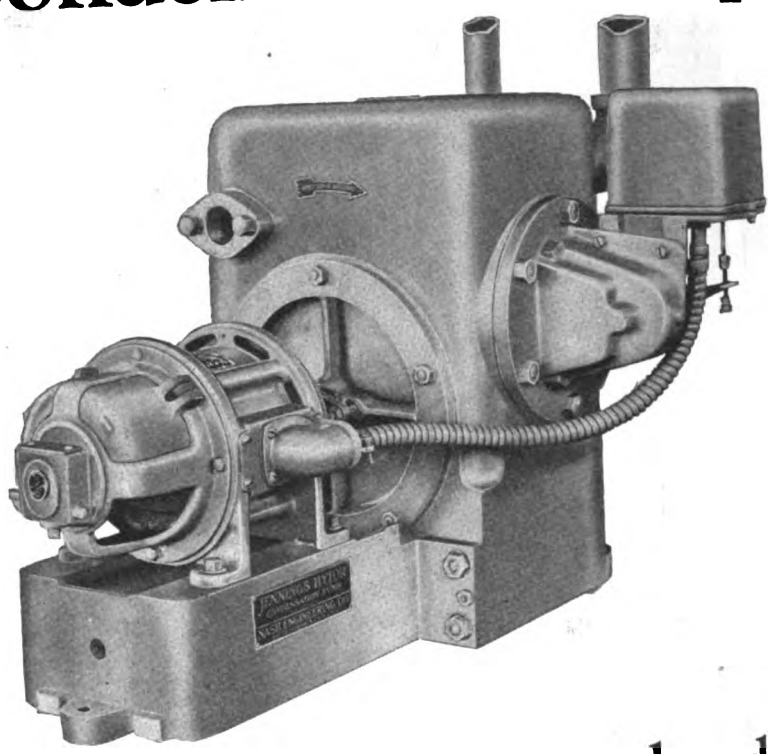
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Motor Driven Jennings Hytor Condensation Pump, Unit Type, for removing condensation from steam heating systems and returning it under pressure to the boiler or hot well. Supplied in sizes for equivalent direct radiation up to 16,000 sq. ft. Standard units designed to deliver full capacity against 15 lbs. pressure at the pump. Larger capacities when so ordered.



Pay for themselves in service rendered

Superior features of the Unit Type Pump

Saving in space: The rectangular form permits installation in a corner against the wall.

Low return connections: Distance from center line of gravity returns connection to floor a minimum.

Quiet operation: Absence of flexible coupling and elimination of separate steel returns tank insure noiseless operation except for slight motor hum.

Impeller: Bronze, open type, self-cleaning.

Cast iron receiving tank: Reinforced cast iron tank, tested by hydraulic pressure. Has large settling chamber.

Companion flanges: Supplied for connections to system. No connections between the pump and the tank are required.

Wiring: Furnished in armored conduit between motor and switch, connected, ready for use.

Ball float: Heavy 5 in. diameter, seamless drawn ball float, tested to 100 lbs.

Float switch: G. E. double-pole float switch, with silver contacts, totally enclosed. Float mechanism can be removed as a unit.

Drip pan: Base forms drip pan, tapped for drain.

Motor bearings: Rugged, with liberal oil wells.

Three point support: Prevents misalignment.

Systems having radiation surface at or below the boiler water line cannot depend on gravity alone for returning the condensation to the boiler, unless the boiler is set in a sufficiently deep pit.

In installations where condensation is being discharged to the sewer, instead of returned to the boiler—coal is continually wasted. In fact, about 1% is needlessly consumed for each 11° F. the condensate is above the temperature of the cold boiler feed water.

Under conditions such as these, the importance of the Jennings Condensation Pump cannot be overemphasized. It effectively removes condensation from the heating system, and returns it under pressure to the boiler.

Jennings Condensation Pumps not only result in greater economy of the system as a whole, but they invariably pay for themselves in the costly boiler pit excavations they avoid, in the fuel they save through improved operation, and in greater cleanliness and efficiency of the boiler plant.

For a complete description of the Jennings Pump, its design, construction, and method of operation, write for illustrated Bulletin No. 29.

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AUGUST — 1925

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES, MATTHEW W. POTTS } *Associate Editors*

ADOLF SCHILDKRAUT, *Art Director*

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Next Month

WHEN you see our September issue we think you will agree with us that it is the most helpful and practical number of INDUSTRY ILLUSTRATED that has yet been published.

For example, William Staniar, transmission engineer for the Du Pont Companies, starts a splendid series on the subject of mechanical power transmission. He shows how vast sums can be saved through the proper selection and control of belting, line shafting, pulleys, hangers, speed reducers, couplings, etc. Mr. Staniar is probably the foremost expert in the world on his subject.

Every factory executive and shop superintendent will eagerly look forward to reading Mr. Staniar's articles which are presented largely in pictures of course.

In addition, the September issue is unusually filled with helpful, practical ideas, presented so that they can be grasped at a glance.

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The Complex Handling Problems of Soap Manufacture

The Procter & Gamble Mfg. Co. Plant at Port Ivory

WHAT are all the factors which go to make up the low price of soap? When we consider that a bar of Ivory can be purchased for five cents and other soaps for practically the same, we little realize what a tremendous amount of management and organization is necessary to make this possible. For instance, the Procter & Gamble Plant, at Port Ivory, being described here, required from 1906 to 1908 to build, and since that time many additions have been made both in buildings and equipment. The first soap was produced here in November, 1907, and since this date many new forms of soap have been developed and are now being marketed.

Port Ivory is a complete manufacturing plant going back to the manufacture of all process materials that can be economically produced. At the present time approximately 1,300 people are employed and about 3,500 mechanical horsepower is required to drive the various machines, etc., used in manufacture. This plant produces the well-known "Ivory Soap," "Ivory Soap Flakes," "P. & G. White Naptha Soap," "Chipso," "Star Soap," "Lenox Soap," "Star Naptha Powder," and several other soap products.

This article is primarily written to describe the various methods of handling materials in process, shipping and storing, but in doing so it will be necessary to touch certain phases of manufacture. For this reason a brief outline of the process of soap manufacture will be of interest. Fat or oil is first boiled with caustic soda lye until it is thoroughly saponified. A homogeneous pasty mass results which consists of soap, glycerine, some free caustic and a few minor impurities. The soap is then "grained" for the purpose of separating the glycerine. This is done by adding salt or brine. Soap being insoluble in the salt solution separates in grains of a curd-like appearance. After standing a sufficient time to settle properly, the glycerine liquid is drawn from the bottom of the kettle for reclamation. The soap curd is then given further salt washing, as required, to remove remaining glycerine. The soap is now "smooth" or "closed" by adding a little water and boiling. It is then ready for the "strong change." This consists of boiling with strong caustic soda to insure that no oil has escaped through saponification. The lye is run off from the soap, which has become grained. After further processing, the mass settles in three layers, the good soap on top, water on the bottom containing some salt in solution, and an intermediate layer of soap.

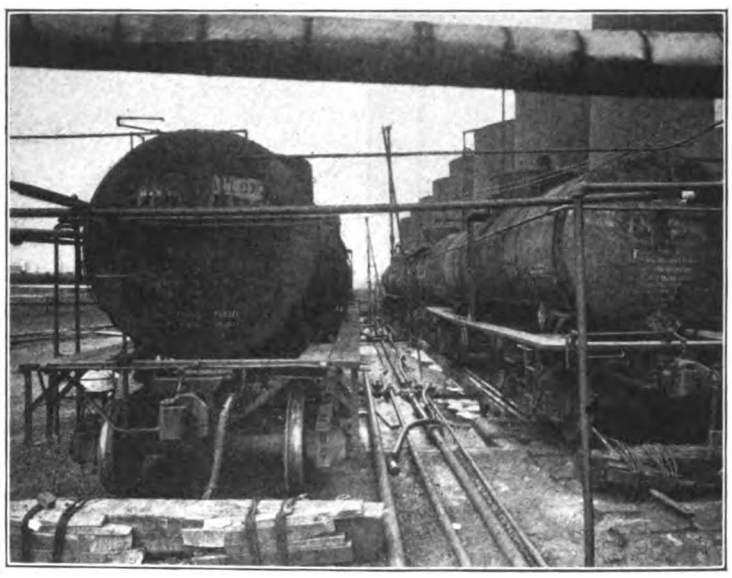


Fig. 1. Raw materials received in liquid form are pumped from tank cars to storage tanks.



Fig. 2. For handling soda ash, one man with a pneumatic conveyor quickly unloads a box car.

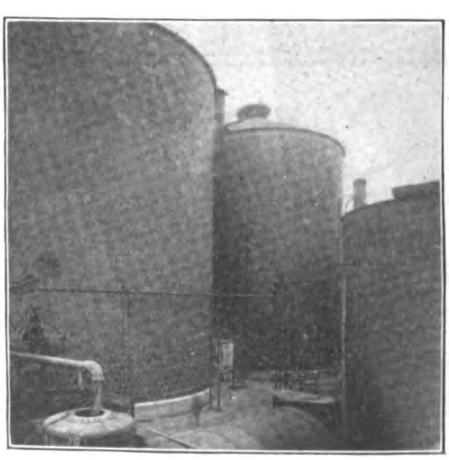


Fig. 3. General view of terra-cotta silos used for storing soda ash, and other raw materials.



Fig. 4. General view of the kettle house showing an electric tractor handling salt and other raw materials.

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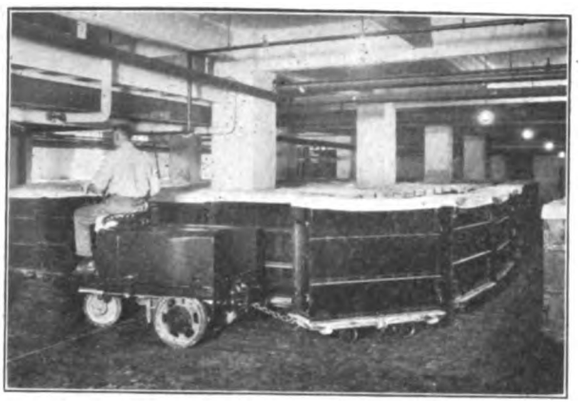


Fig. 5. Electric tractor trailer trailing six loaded soap frames from crutcher to storage bay.

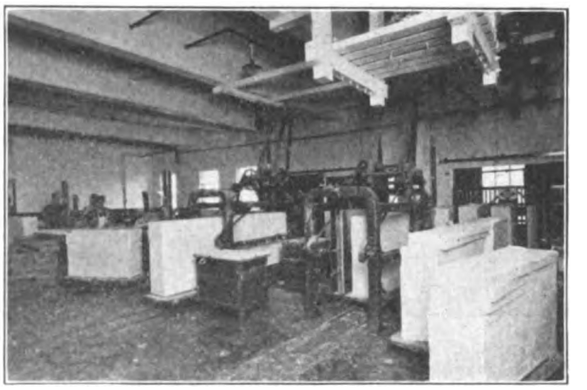


Fig. 6. Soap is mechanically cut into slabs and bars with very little handling.

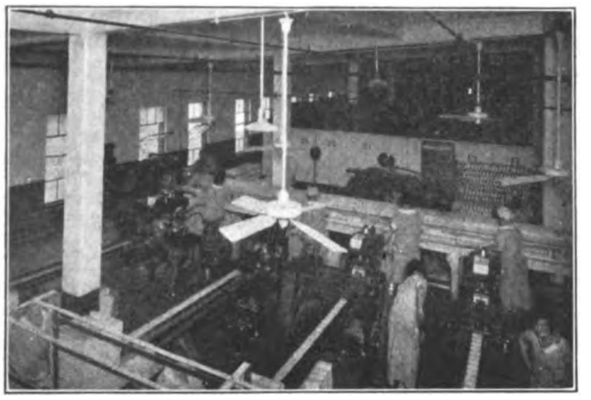


Fig. 7. General view in a soap packing department showing belt conveyors and automatic wrapping machine.

of an inferior quality, called "nigre." The "nigre" carries down impurities that have escaped the earlier purification process. The top layer, therefore, is soap of the very highest purity possible. From here on the process is regulated by the product being produced.

To handle the various materials used in soap making, many types of equipment come into play. The oils, fats, etc., are usually received at the plant in tank cars, as shown in Fig. 1. These cars are given careful analysis for the materials' chemical properties and then steam is used to liquefy any solid. By attaching a rubber hose to the bottom of each car the liquid is pumped direct from cars to storage tank. The pipe lines are clearly shown in Fig. 1, but the pumping equipment is not illustrated. This consists of steam driven direct acting pumps.

Other raw materials are received in another part of the plant. These consist of soda ash, lime, etc., which are used in the manufacture of caustic soda, and other ingredients needed for soap making. These materials are unloaded direct from cars and stored in large terra cotta silos. Soda ash is unloaded from cars and elevated by means of pneumatic conveyors (Fig. 2) to the silos, as shown in Fig. 3. The reason for using a pneumatic conveyor for soda ash is to overcome the difficult working conditions generally incurred in unloading this material due to its dusty nature. Both lime and soda ash are handled from the silos by means of belt conveyors and are then put through certain process steps before actually being used in the manufacture of soap.

With large scale operators practically all soap is made by the "boiling process." For this purpose the large kettles are located in multiple-floor buildings and in these kettles saponification takes place and the manufacture of soap is accomplished. A general view in one of the kettle houses showing the top or working floor and the kettles is presented in Fig. 4. In addition, an electric tractor is shown hauling trailers containing soap scraps and salt which are added to the process at this point. The use of the tractor permits quick handling of these heavy loads and saves the men from being strained by slipping when pushing these containers by hand.

The handling of soap from these kettles is accomplished by means of various types of pumps and pipes with many valves and by-passes. By using plenty of steam after each charge has been drawn off from the kettles the pipe lines are kept free and clear. For this, and other process reasons, it is necessary to provide many by-passes in each line, thus making the handling

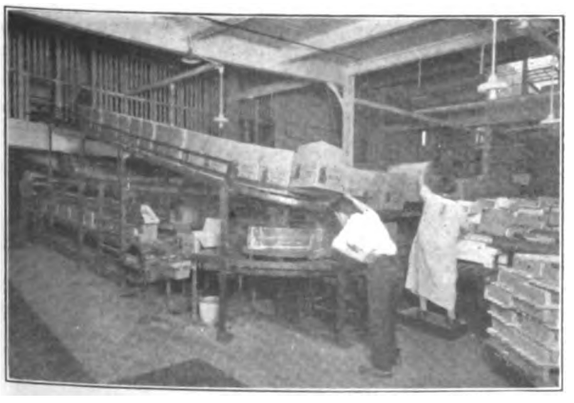


Fig. 8. Various types of conveyors are required in all packing departments for handling soap after it has been packed into cartons.

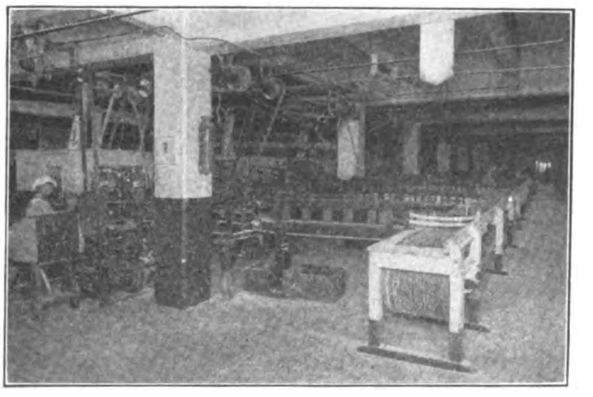


Fig. 9. General view of the soap powder packing department showing how machines feed to one main belt conveyor.

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Fig. 10. Wooden boxes are transported from the box making department to all other packing departments by means of conveyors.

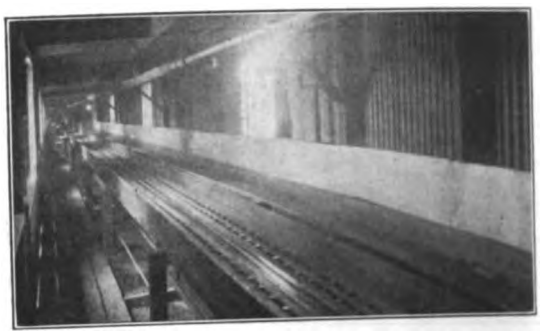


Fig. 11. This drag chain conveyor with rollers in the trough bottom handles empty boxes over the roof of several buildings.

systems at first glance seem somewhat complicated.

As the soap is drawn off from the kettles it goes direct to crutchers where it is stirred while hot to give perfect uniformity, or whipped, if a floating soap like "Ivory" is required. The crutchers serve as a mixing machine, and if laundry soap is to be made, there is added at this stage, any of the various materials which may give the soap such special qualities as the manufacturer desires.

The initial start of mechanical materials handling takes place after the soap has been thoroughly mixed in the crutcher, and is ready to be placed in the cooling frames. These cooling frames consist of a wooden placque base fitted with two rigid shafts and four 4½" diameter wheels. The sides and ends are made of iron, and are constructed in such a way that they can easily be removed. After the frames have been filled they are coupled together with single chain hitches and propelled in trains of six by means of an electric tractor to the cooling floor. Here the soap is allowed to solidify and cool. The illustration in Fig. 5 shows the electric tractor with a trainload of frames. Note the narrow aisle down which this train operates, also how the frames are stored. The floors in this department are all covered with iron plates. This permits easy cleaning, and the plates stand the wear and the chemicals better than wood or cement.

After soap has stood in the frames for a certain length of time the sides and ends are taken off, leaving a solid cake weighing from 800 to 1,000 pounds resting on the wooden placque base. This cake is scraped clean and raised on freight elevators to other storage floors for further drying. After the final drying process has been accomplished the soap is elevated to the fourth floor of the building, and as it is taken from the elevator, it goes to the slabbing machine (see Fig. 6). This machine has a series of parallel horizontal wires which are forced into the soap, cutting it into slabs. The slabs are then inspected and are passed through other machines, one at a time, and cut into bars. Imperfect bars and waste or clippings are immediately discharged to belt conveyors and transported to the proper pre-heating tanks for re-working. Thus waste is cut down although imperfections slow up the rate of production to a considerable degree.



Fig. 12. The packing of soap flakes is done automatically even to the forming of cartons.

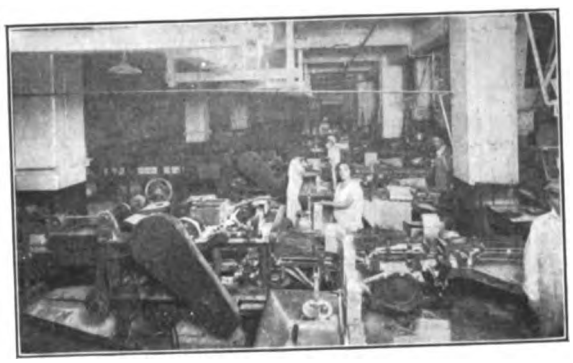


Fig. 13. After soap flake cartons are packed, they are carefully check-weighed before being put into the large shipping cartons.



Fig. 14. In the soap flake department all cartons are brought to one point for sealing.

After the bars have been cut, the machines discharge them onto wooden racks which are loaded onto four-wheel platform trucks. These trucks pass into drying tunnels, and are propelled through the dryers by means of chain conveyor feeders which grip the truck being put in and in this manner push the whole train forward. The discharge from these tunnels, in the "Ivory" department, and their respective numbering can be seen in Fig. 7. After the soap has been thoroughly dried it is discharged from the dryer in direct line for the

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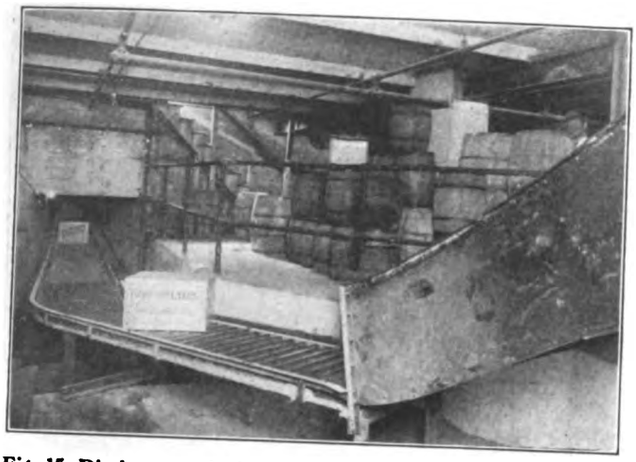


Fig. 15. Discharge end of the chute shown in Fig. 14 showing method of feeding tunnel conveyor.

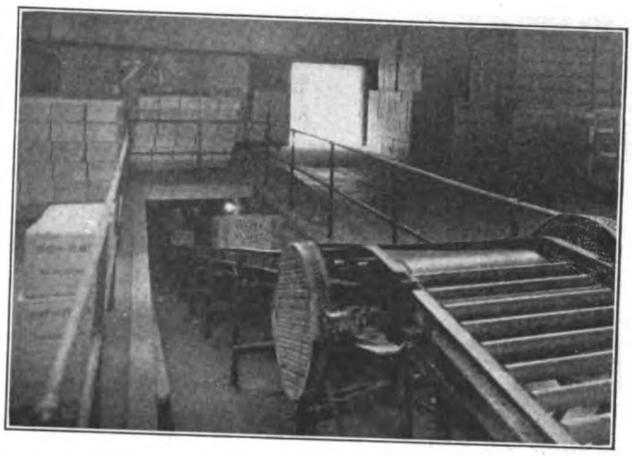


Fig. 16. These packages have just passed onto the railroad track by way of a tunnel and conveyor.



Fig. 17. After soap flakes have come through the tunnel they can be loaded to skids at this point or continue to the storeroom on other continuous conveyors.



Fig. 18. This bridge contains four conveyors to transport boxes from the manufacturing departments to the storing and shipping departments.

next operation. Here the bars are again inspected, and are fed by means of small belt conveyors, direct to the machines which finish the bar and imprint the name or trade mark. Needless to say, the stamping and wrapping of soap by machinery makes it possible for an incredible amount of soap to be turned out by a few artisans.

After the soap has been wrapped, it is packed directly into cardboard cartons, or wooden boxes, as desired, and these are fed to wooden platform conveyors, belt conveyors and gravity conveyors for transportation to other parts of the plant. Fig. 8 shows part of the packing room where "Satin Gloss Soap" is being packed. Here the cartons are fed to the packers by one gravity conveyor and after being packed are discharged to the slat conveyor, shown in the foreground, which feeds direct to a carton sealing machine. Department layouts make it necessary to locate these conveyors differently and thus the sealer is sometimes on the same floor with the packing, while in other cases it is on the floor below. In each case, the material passes direct from the sealer to additional slat conveyors, belt conveyors and gravity conveyors, which all come to one central point, as described later.

Soap powder is also packed in this plant. The method of doing this by automatic machinery is clearly illustrated in Fig. 9. There is one important point here which shows that actual practice calls for a particular equipment for certain conditions. For example, the belt conveyor, shown to the right, is a 20" leather belt, 165 feet long. The reason for using leather is that if a canvas belt is used the small cartons catch and and tear, while leather allows easier sliding and less damage to the packages. One of these leather belts has given over six years service. This soap pow-

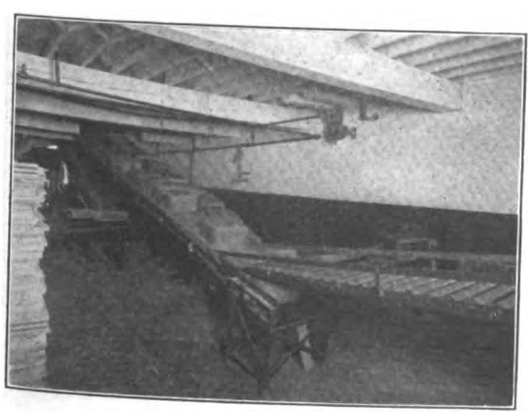


Fig. 19. This is the centralized point where all finished products come together for transportation over the bridge.



Fig. 20. View looking through the bridge shown in Fig. 18, showing how the four conveyors are located.

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Fig. 21. After the boxes are transported across the bridge they discharge to these four runs of gravity roller conveyor.



Fig. 22. This illustrates the method of sorting the packages according to brand. Note the type of lift truck skids used.

der is also transported back to the centralized point by means of a chain conveyor propelling the boxes and cartons over a gravity roller runway, similar to those described for handling empty wooden boxes.

Most of the wooden boxes used in this plant are assembled in one box shop shown in Fig. 10. Here the sides and ends are nailed by one machine and conveyors feed these to the man placing the bottoms. Another conveyor, shown to the left, transports the boxes through a planing machine, which takes off the rough edges. They are then inspected and dropped on other conveyors and transported to an inclined push-bar chain conveyor, which elevates them at a 60-degree angle and discharges them to the drag chain conveyor (Fig. 11), which passes over the roof of a four-story building. At different points, transfer junctions are made to belt conveyors, and the boxes are transferred from the main conveyor at these junction points by the man in charge of the boxes in each particular department. After a wooden box has been filled in a department, it passes by means of a conveyor to the machine which nails the top in place. It is then fed to the same conveyor which handles the cartons, and is brought to the one centralized point, previously mentioned.

Soap in the form of flakes is made by the same process that is used for bar soap, except that the hot paste is cooled in thin sheets by running it over cold steel rolls, scraping from these in the form of thin ribbons and drying them. For instance, "Ivory Soap" and "Ivory Soap Flakes" come out of the same kettle. They are only finished in different forms. The handling of soap flakes is somewhat more difficult than bar soap, and for this purpose belt conveyors of the trough type are used. These conveyors feed to hoppers over automatic sealing machines, as shown in Fig. 12. The packing machines are of the latest type and the cartons are formed, filled and weighed by the first unit, while a second unit (Fig. 13) check-weighs, closes, seals and transports them by means of belts to the girls who pack these small units into large shipping cartons. Gravity conveyors carry empty cartons to the packing girls and wood slat conveyors bring the full cartons from the packing girls to the sealing machines, shown in Fig. 14.

After the carton is sealed, strips are placed across the top and the



Fig. 23. Skid loads of finished products are transported from warehouse to car by means of electric industrial trucks.

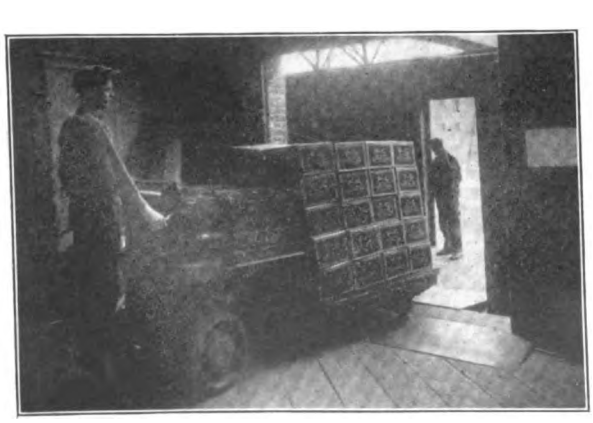


Fig. 24. Resin is transported from the yard storage to this arm elevator by means of narrow gauge industrial railway.

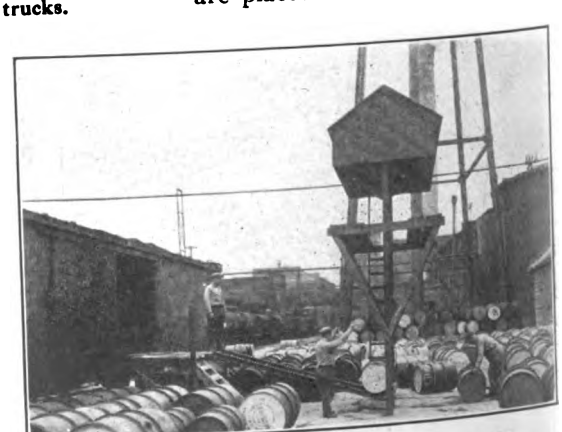
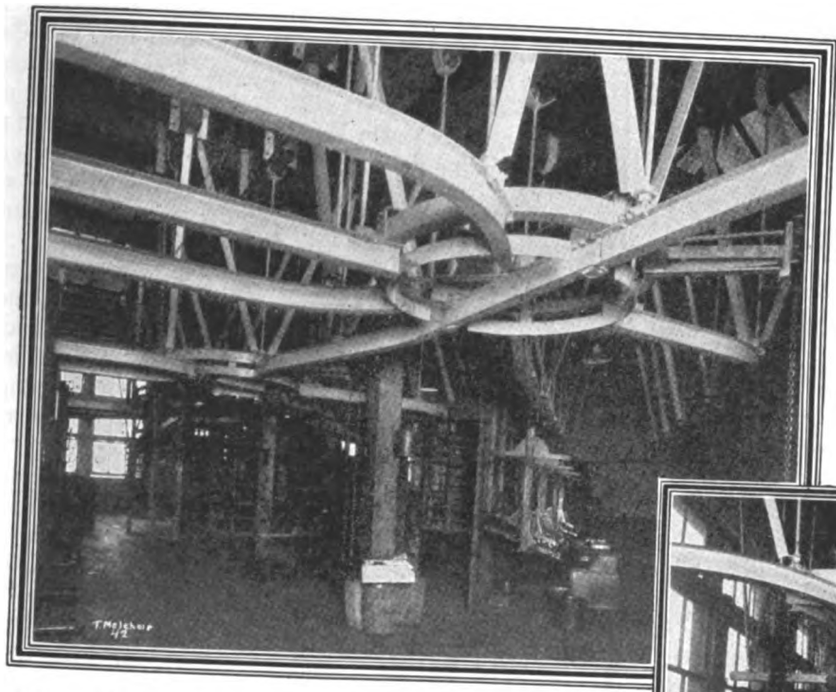


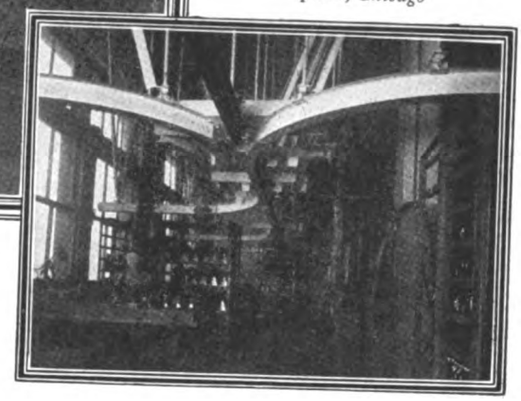
Fig. 25. This home-made rig equipped with an electric hoist has reduced the cost of handling glycerine drums.

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"Quality leaves its imprint"

OveR-Way conveying equipment in Union Special Machine Co. plant, Chicago



OveR-Way Costs Nothing —It Pays for Itself

J. V. Carlson, Factory Supt., Union Special Machine Co., Chicago, *says:*

"A year ago our japanning department foreman was calling for more oven equipment, to supplement the four ovens then in use. This would have meant a considerable investment and additional space. Instead, we installed 420 feet of Richards-Wilcox OveR-Way conveying equipment.

"This not only made a new oven unnecessary, but even abolished one of the four in use, because better handling made possible 3 heats a day per oven instead of 2. Our old home-made, slow-moving, heavy double-rail overhead conveyor, was replaced with an R-W I-beam trolley track, with 3 turntables. With this equipment we move 1-ton loads on hanging racks infinitely quicker and easier.

"With the help of the OveR-Way we have worked out a progressive japanning system: the japanner dips, drains on racks on one trolley, places on an oven rack on another trolley, and pushes this right into the oven—an operation that used to take four men.

"When the baking is complete, the sanders immediately remove from the oven, push to track sidings over their benches, remove, rub and return to the oven. Formerly a charge had to cool in the oven; then two men spent 1½ to 2 hours unloading it.

"This system saved approximately one-fourth of every hour—our department bonus rate was increased 25%. We figure we saved the cost of the installation in a year, not counting the great saving in space and the safer handling."

Ask R-W engineers to show you how OveR-Way will pay for itself and add profit to your business. There's no obligation on your part.

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two sealing machines fed to gravity conveyors, which converge at a steel chute, as shown in Fig. 14. Cartons of "Ivory Soap Flakes," "Chipso," etc., are discharged to this chute, and are then transported by means of belt conveyors, shown in Figs. 15, 16, and 17, through a tunnel under the railway track, and into the bar soap manufacturing building. Other belt conveyors then elevate and transport these boxes to the centralized point previously mentioned.

The reason for bringing all products to one centralized point by means of conveyors is a new step in economical operation, namely the centralizing of all products for storing and shipping. Fig. 18 shows to the left the manufacturing buildings where bar soaps and soap powders are made, while to the right is a new warehouse with a two-track railroad siding. To transport all the materials to this warehouse by any other means than conveyors would be well nigh impossible. For this reason the bridge shown was constructed and four runs of conveyors were placed over the bridge to handle all the products. These conveyors are placed side by side and in two tiers, as shown in Fig. 20. All the manufactured materials feed onto the four belts at a centralized point shown in Fig. 19. The gravity conveyor in the foreground is bringing all types of "Ivory" soap while through a hole in the wall can be seen the "P. & G. Soap" feeding to another conveyor; and in the background can be seen boxes of "Lenox Soap," soap powders, soap flakes, etc., feeding to the two conveyors on the bottom tier.

In the new warehouse, all materials are now discharged at one centralized point. By referring to Fig. 21 we see how the different products come down chutes and conveyors from the bridge, direct to the warehouse floor. When goods are bunched together in transportation, it is necessary to have a sorting out location. The method of sorting is clearly illustrated in Fig. 22. Here the empty skids are placed so the men remove the cases direct from the gravity conveyors to the skids. These skids are then picked up by electric lift trucks and transported direct to the pile, where they are stacked by hand to await shipment. Frequently, if desired, the goods can be transported direct to box cars by means of these trucks and the loaded skid placed inside of the car (Fig. 24) so as to eliminate carrying of the packages as much as possible.

Thus we have covered the continuous process of soap handling by means of various conveyors, packing machines, etc. It, of course, must be realized that many other handling operations are required about this plant. For instance, the handling of resin, which is used in making of the intermediates, requires the transporting of barrels from the yard storage by means of industrial railways to the process building, where they are used. Here they are unloaded direct to a barrel arm elevator and raised to the second floor (Fig. 23). In this same building another little drag chain conveyor is used for carrying out the barrel staves, etc., to a wood refuse pile.

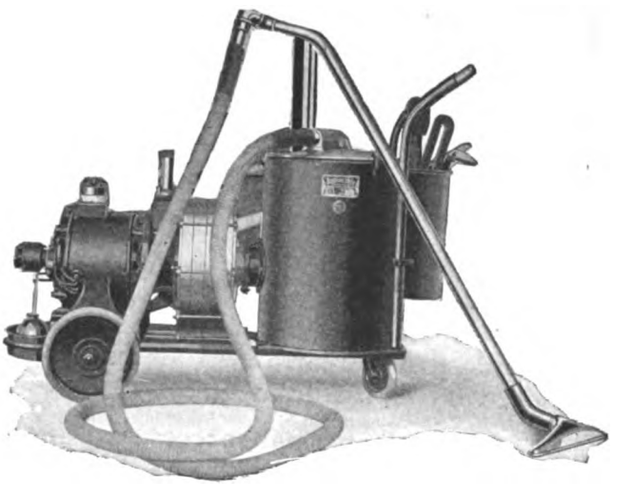
Glycerine was formerly a waste product and thrown away, but by developing a chemical process, this valuable material is now a by-product of soap making and in itself creates a handling problem in the storing and shipping of drums. As the drum is easy to roll, the transporting is done by this method, but the loading of drums formerly required about eight men to hoist them up the skids into cars or onto the car loading platform. By

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"INVINCIBLE"

Portable Vacuum Cleaner still working perfectly after 7 years handling metal dust, filings, etc., for Cincinnati Planer Co.



Ed. Shaw, Cincinnati Planer Co., Cincinnati, says:

"Our Invincible Portable Vacuum Cleaner has been in steady use since 1918. In spite of the fact that it is constantly used to pick up metal dust, filings and clippings, it has never required a cent's repairs except for a new hose.

"On account of its portability the Invincible works all over the shop. In our casting cleaning department, it draws dust, filings, and clippings out of inaccessible parts of the casting. Before we used an "INVINCIBLE" our patterns had to be made with holes in them or spaces had to be left in the castings through which the dust could be blown out with compressed air. This was not thorough and left the dirt and filings all over the shop.

"Our Invincible is also very handy for getting at the inaccessible places in our machines. It improves general working conditions in the plant, because the dust and filings are drawn into the cleaner instead of being blown about the shop. Reducing the amount of metal dust in the plant also helps protect the highly polished metal surfaces on our planer beds, boring mill tables, etc.

"Another important use for the Invincible is keeping our tool room shelves and bins clean—an operation that formerly took much time and then could not be done with any degree of thoroughness.

"The ordinary vacuum cleaner could not stand up under this type of work, nor would it be anywhere near as efficient."

Invincible Vacuum Cleaner Mfg. Co.

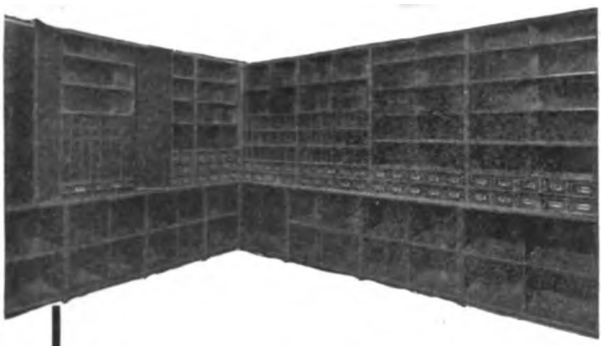
Dover, Ohio

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taking an electric hoist and mounting it as shown in Fig. 25, one man now brings the drums from storage, one man hoists them to the car loading platform, while two or more men stow them into cars.

With a plant as large as The Procter & Gamble Manufacturing Company at Port Ivory, the receiving and handling of materials within the plant yard requires a real traffic department. For this reason, yard handling is separated from departmental handling. The yard department check-weighs all incoming materials by using two large track scales, and then deliver it to the proper unloading point. For hauling and shifting cars about the yard, three large locomotives are used, and these are provided with a separate round house. These locomotives play an important part both in the handling of raw materials and finished products and are therefore necessarily considered as a part of the materials handling equipment.

For the handling of coal, both unloading cars and in the storage pile, also for the handling of cinders, which are used as fill, and other refuse, two locomotive cranes with grab buckets are used. Thus we find even fuel and waste products requiring mechanical equipment for their disposal.



Lowering Storage *and* Stocking Costs

TIME wasted in futile trips to the wrong bin or shelf, inadequate stock accounting, shortages and over supplies are but a few of the items that help to swell the expense of maintaining an old fashioned stock room.

These items can be curtailed or entirely eliminated with a system of Durand Steel Racks, Bins and Shelving.

Such a system is exceptionally flexible. It is built up of standardized units that can be interchanged and rearranged almost at will to meet varying requirements.

The system is a permanent asset. Durand storage units are built entirely of steel. Their period of usefulness is almost indefinite. Their repair, upkeep and replacement costs are negligible.

The result is a methodical storage system.

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LOCKERS BINS STEEL SHELVING RACKS

Reed Ratchet Pipe Stock

THE Reed Manufacturing Company, of Erie, Pa., have recently placed on the market a new ratchet pipe stock with capacity up to 2 inches, right or left hand. The stock slips over the end of the pipe or bolt to be



cut, adjustable grinders opening for this purpose. Moving the cam closes the chasers and centers the pipe or bolt.

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Volume and Variety Call for Efficient Layout

How the Fuller Brush Company Minimizes Handling

THE handling problem at the Fuller Brush Company is one of diverse products in large quantities. Last year this plant produced 23,305,624 different items of over a hundred varieties, as shown in Fig. 1. The lightness of the material makes it easy of transportation, but due to the many operations, considerable planning and routing of materials is required.

For making brushes, mops, etc., it is necessary to handle bristles, horse hair, fibre, cotton, wire, various types of handles, etc., all received from different sources and in assorted grades. This makes it necessary to provide ample storage room for raw materials, and to use mechanical means wherever possible for piling and storing, in order to take care of peak loads when receipts are bunched. Fig. 2 shows how fibre is received and trucked from car to store-room, dial scales being used to facilitate check weighing of all incoming materials. In the background of this illustration can be seen a portable elevator piling cases of bristles that have been received from China; a time and labor saving method.

The preparation of bristle and hair before taking these materials to the assembling or manufacturing department requires a considerable number of handlings which must necessarily be done by hand due to the relatively small volume of each class of material. One operation is the cutting to proper length, the second operation is the cleaning and sterilizing, while the third is the assembling of unit lots for the brush makers. Fig. 4 shows how each unit lot of bristle or hair is weighed and counted before being placed in receptacles for transportation to the next operation. Here a mechanical electrical counter assists in keeping track of the number of units handled. As the girl takes a unit from the scale and ties it by means of a rubber band, it is dropped through a chute in the table. In passing down this chute, it makes electric contact, which actuates a solenoid coil, this moves the counter one figure. This coil and



Fig. 2. Weighing and storing of raw materials is made as easy as possible by mechanical devices.



Fig. 3. Good concrete roads permit quick yard transportation. The blower system collects all process refuse material.



Fig. 4. Hair and bristles are weighed and tied in exact amounts for one brush. This illustrates how girls weigh and count each unit.

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Fig. 5. Odd-shaped brushes being trimmed and finished brushes being inspected and packed. Note the carton sealing machine in the background.



Fig. 6. Cotton mops are dropped from the inspection floor and baled for shipment, handles being sent loose.

counter can be seen mounted on the back of each table.

The wire used in making brushes is scientifically treated to prevent rust and is received at the plant in coils. A large supply is kept on hand and the straightening and cutting to exact length is all done on the ground floor of the plant, adjacent to the materials preparation room. At this point, the bristles or hair, and the wire come together and are transported by large platform freight elevators to the second floor, or brush assembling department. Here the material is placed between two strands of wire and wound into the familiar form of Fuller brush. The brushes in this rough form are then placed in box caster trucks and transported to the trimming machines.

The trimming of the brushes is done mechanically by high speed revolving knives and all of the clippings or refuse is transported from these knives by means of a blower system which deposits same in receptacles conveniently placed outside the building, as shown in Fig. 3. There are two such units used for this purpose.

After a brush is trimmed it is bent to form and the next operation is the fitting of the handle. From the trimming machines to the handling department they are again transported in box caster trucks, as shown in Fig. 7. A large number of brushes can be handled in one truck.



Fig. 7. The type of wooden and fibre box caster trucks shown in this photograph are largely used for all handling operations. This shows the department where brush handles are attached.

The odd-shaped brushes, such as window brushes, etc., are also transported in the same method, direct to the inspection tables as they are shipped without handles. The inspection department is shown in Fig. 5. Here all brushes are thrown in lots, onto sorting tables, and are inspected and packed by unit lots in small cardboard boxes, with the Fuller inspection tag attached. These smaller box units are then placed in large corrugated boxes, sealed by a mechanical sealing machine, and are ready for stock or shipping. In this way, unit lots can be sent to the eleven Fuller distributing stations throughout the country, and from these stations they are again sent parcel post to the salesmen for final distribution.

The cotton mops, instead of being packed in cardboard cartons, are dropped by gravity into one large chute, which feeds to two baling machines. Here they are baled in unit lots, as shown in Fig. 6. These bales are piled in stock by using a portable elevator, similar to that shown in the background of Fig. 2.

The new industrial and household broom division of the Fuller Brush Company is one of the latest department layouts in this plant, and is a good example of proper department planning so as to eliminate transportation wherever possible. Fig. 10 shows a portion of this broom department and while at



Fig. 8. Spiral chutes are used for lowering packages from the first floor packing department to the ground floor shipping department.



Fig. 9. Gravity roller conveyors attached to the end of the spiral chute transport boxes direct to the cars for shipment.

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first glance it seems congested, it will be seen by close study or by a personal visit, that it is properly arranged without cramping the movements of anyone working on these brooms. For instance, "A" is the point where the raw fibre is placed in holders in the initial step, "B" is the dipping tanks where the butt ends are dipped in a tarry compound to prevent the fibre from coming out, "C" is the operation which clamps the butts and trims the sweeping end of the broom, "D" is the operation where loose fibre is taken from the brooms and each piece is combed and straightened. It will be noted that there is no stopping of material in process and each man hands his work to the next operation in unit lots. In continuing down this room, the broom is sewed, cleaned, inspected and properly prepared for fitting of the metal base and handle, which is done on the return down the opposite side of the room. In a very short space of time, the raw material is fed in at one end and eventually returns to point E, where the completed broom is painted as illustrated in Fig. 11. This is practically the first point where transportation is necessary in this department, and the reason for it here is due to the size of the units being handled. This one small department approximately 140 feet by 80 feet with about 80 employees can turn out 5,000 brooms in eight hours.

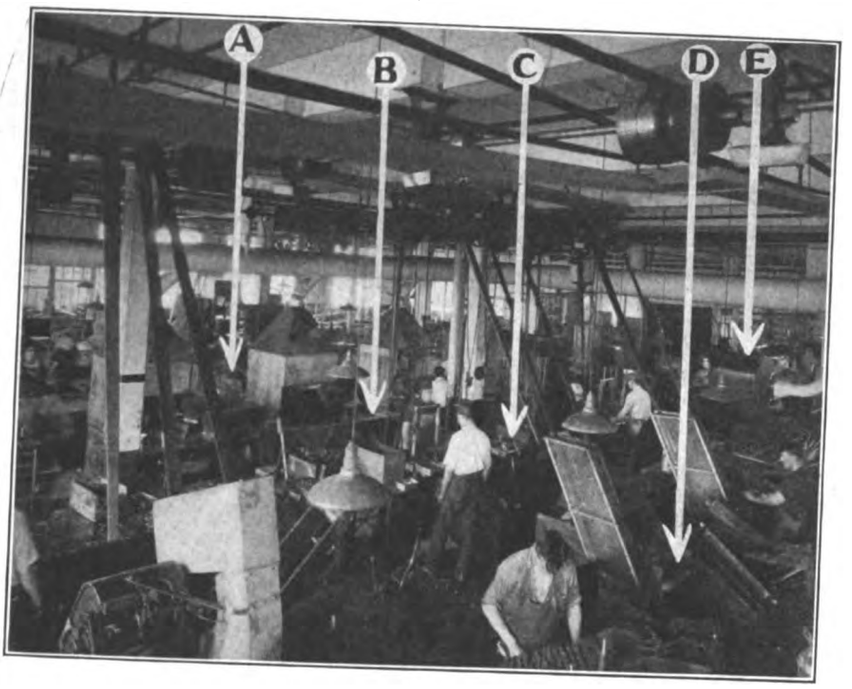


Fig. 10. Letters A, B, C, D and E illustrate the sequence of operations in the broom department. This layout of equipment eliminates transportation and handling consists of passing from one operation to another.

After the brooms have been painted, they are allowed to dry and are then transported downstairs by freight elevator to the wrapping and shipping department, shown in Fig. 12. Here they are tied in bundles of twelve for shipment. These brooms are then lowered to the shipping floor by means of spiral chutes. This same spiral chute is also used for lowering cases of brushes which are also transported to freight cars by means of gravity roller conveyors, as shown in Figs. 8 and 9.

In transporting materials, about 200 box caster trucks and 300 tote boxes are required for handling small metal parts, brush handles, etc. Six hand lift trucks, with thirty platform skids, are used for handling raw materials. About fifteen stevedore hand trucks and several four-wheel platform trucks are also used for transporting materials from one department to another. A number of dial scales are placed throughout the plant for weighing and check-weighing so as to eliminate transportation wherever possible, thereby reducing production costs.

The principal development in materials handling by this company is its layout of manufacturing departments to eliminate transportation wherever possible. While, at first glance, many would think conveyors could be utilized for further reducing manufacturing costs, in studying the methods used here, one finds that by passing materials from one operation to the next, not only eliminates transportation but conserves time and floor space.



Fig. 11. This is a broom truck and shows the method of handling while the base of the broom is still wet after being painted.

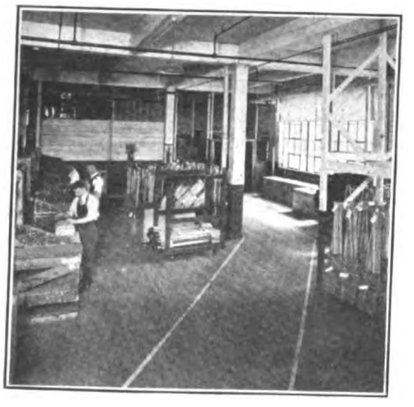
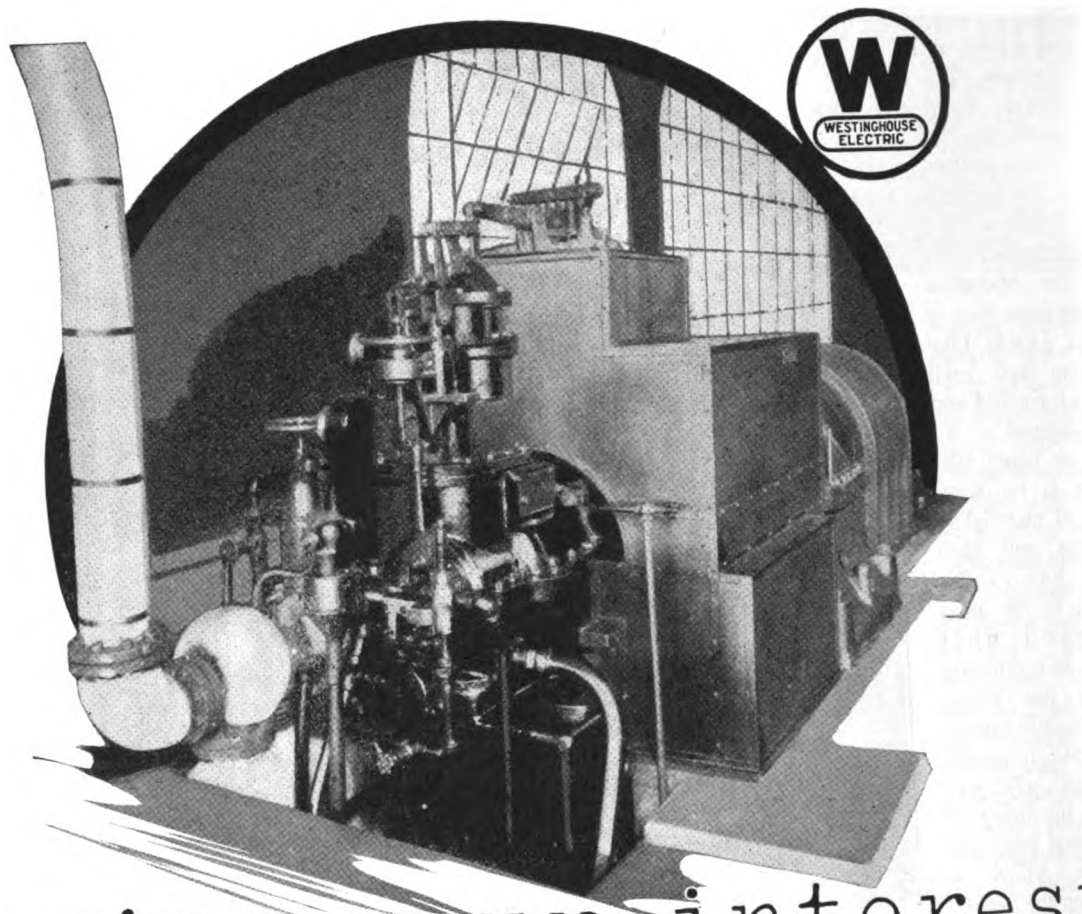


Fig. 12. Brooms are brought to this central shipping department on caster trucks, as shown in the foreground. After wrapping they are stocked or immediately passed down a spiral chute to shipping platform.



Fig. 13. All circulars, booklets, etc., for salesmen are printed at the factory. Hand lift truck methods are used for handling paper stock and finished products in this department.

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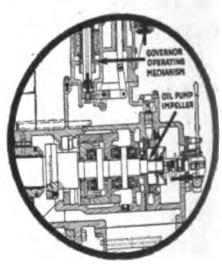
Knowing your interest in

—our 750 KW Westinghouse turbine, it occurs to me the result of a complete inspection of this unit will be of interest to you—so writes the chief engineer of a well-known manufacturer to an interested friend.

"As you know, it has been running thirteen months and sometimes as much as a month at a time without being taken off the line. The inspection revealed everything in first class order. Not a thing was done to the machine.

"I was particularly pleased that this was true of the governor system. With the usual types of governors there would be some play in linkage bushings, wear on the cross shaft gears, knife edges dulled, thrust wear, or the like. The more I see of this 'centrifugal pump' governor, its adjustability, simplicity, and great power, the more I feel that it represents a real advance in the art—and science.

"As to the oil in the system, I would not blame you if you doubted the following—but it's the truth. The oil was run through a centrifugal purifier and we got nothing—neither water nor sludge. I consider this distinctly unusual especially with a gear and with ordinary oil which had been in use six months. This is the first time this has ever happened in my experience over a considerable variety of machines."



A Governor without the Familiar Failings

—No knife edges
—No linkage
—No revolving weights
—No gears to drive governor or oil pump
—No stuffing boxes
—No close clearances
—No springs in compression to buckle

And that's not *all*. Get circular 1704 for the *remainder*.

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The Steam Turbine with the Solid Steel Rotor



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The Handling Problem of Brown & Sharpe Manufacturing Co.

A 32-Acre Plant, Cut by Three Streets, and Without a Railroad Siding

THERE is no doubt that the name "Brown & Sharpe" is well known throughout the machine tool industry, but very little has ever been written giving the inside facts about the methods employed for the handling and transportation of materials within this well known plant.

Brown & Sharpe Mfg. Co. originally started with a small manufacturing unit in the year 1833, and has had a steady growth until now it consists of a number of buildings occupying nearly thirty-two acres. One of the first handling problems which presents itself is the fact that the plant is not located on a railroad siding or boat slip. It is therefore necessary to handle all incoming raw materials and outgoing finished products by motor trucks or horses and wagons. The second difficulty of handling in this plant is the intersecting of the property by three public streets. This maintaining of public thoroughfares through the plant is a more serious handicap than not having a railroad siding or boat slip, for the simple reason that all inter-departmental handlings made by the main transportation department necessarily have to cross one or more of these streets. This frequently leads to delays and slows up the work. Bridges between buildings minimize this influence and contribute to an efficient system. This physical layout of the plant has a great bearing on the transportation system now in operation.

This company manufactures its products from raw material, and the foundries for casting the metals are fully equipped with various cranes and mechanical devices to minimize or simplify handling wherever possible. For charging the cupolas four-wheel trucks and wheelbarrows of the type shown in Fig. 1 are used; handling coke, limestone and iron. To expedite placing these charges all materials are weighed well in advance, and left in these various pieces of equipment until required. This preparation beforehand guarantees the cupolas receiving the proper proportion of material at the right time, and also assists in checking up the materials used.

In the foundries, operations are very much similar to those found elsewhere, and much of the equipment is of the same type, but designed and built to fit the buildings in which it is being used. For instance the

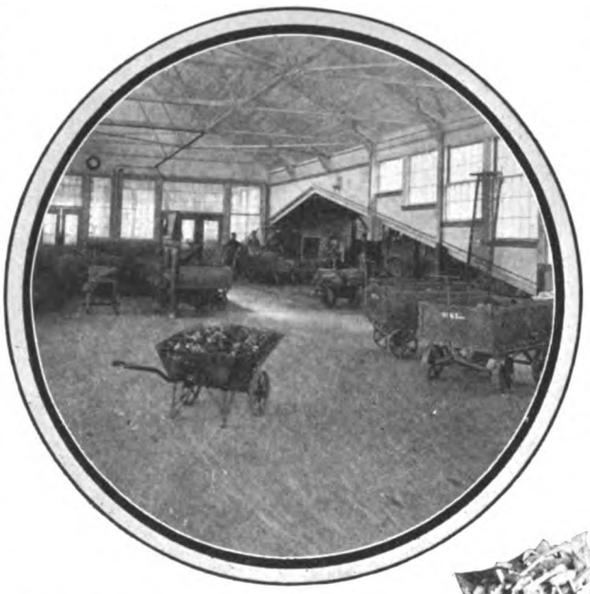


Fig. 1. All materials for cupola charging are handled in the types of equipment shown. In this way charges are prepared well in advance.



Fig. 2. Hand truckers are provided with every safety precaution. Note the hand bars on the wheelbarrow.

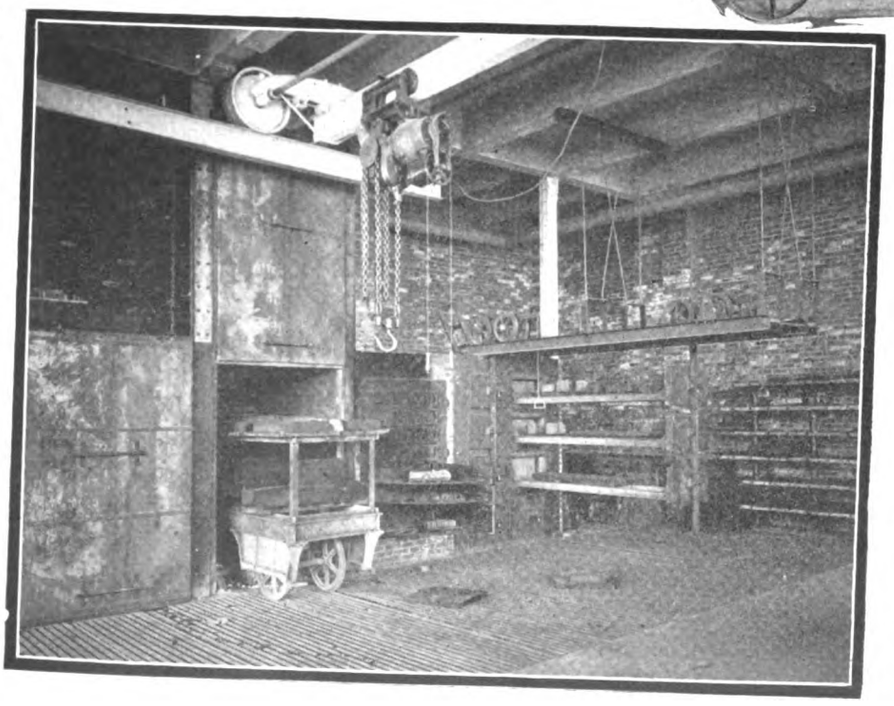


Fig. 3. Three types of core ovens. Each has its place in production methods. Materials of this nature require careful handling.

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Fig. 4. In the foundry, where large castings are made, overhead cranes and wall jib cranes simplify the handling of large molds, patterns and castings.

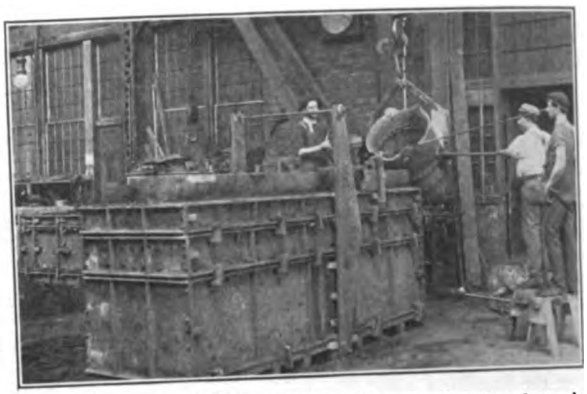


Fig. 5. Close-up showing how the crane assists in the handling of large ladles of hot metal.

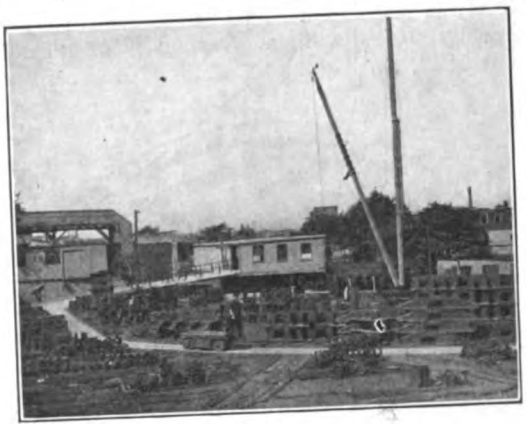


Fig. 6. By encircling the boom derrick with a concrete roadway, the handling of heavy castings from and to outside storage yards has been simplified.

core ovens, shown in Fig. 3, could be used in many plants. The ovens shown are only a small portion of those installed and operating. In the small parts foundry the well-known overhead I-Beam trolley system for handling ladles of hot metal is used. An important feature of this foundry is the concreting of the entire floor area to facilitate trucking. In the large parts foundry, overhead cranes, jib cranes, and other mechanical devices are used for the handling of patterns, flasks, castings and hot metal, as shown in Figs. 4 and 5. In addition to the equipment shown in these illustrations, there are several other electric cranes of smaller size and a number of electric and chain hoists used.

Many outside storage yards in industrial plants are considered unworthy of attention from a point of handling. The Brown & Sharpe Mfg. Co. have made an exception to this rule and we find their storage yard properly laid out, as shown in Fig. 6. This equipment is used for handling the castings to and from the electric trucks which brings such parts from the foundry. The concrete run-way in this yard saves the truck equipment and reduces battery current consumption. It is felt that the installation of this concrete run-way has done much to improve operating conditions in the yard, and that it materially speeds up the handling of such castings.

Prior to a few months ago, all castings used in this plant were hand painted, and this work required the services of two men all day long. It was felt that increased production, or the necessity of painting additional parts, would require more labor in this department, so consideration was given to the installation of mechanical equipment. With this overhead I-Beam trolley system the parts are suspended from trolleys, as shown in Fig. 7, and are transported direct to the dipping tank where an electric hoist lowers and raises them for painting. They are then pushed forward to a drip pan and are finally brought onto another overhead track for drying. Since the installation of this equipment, it has been found that one man, with the aid of an electric hoist, can handle the heaviest pieces, and that a 50% reduction in painting costs has been effected.

There is no doubt that the Brown & Sharpe Mfg. Co. have an entirely different handling problem than the other plants described in this issue, for the reason that each part made and handled is precision work, and in the assembling of the finished machines it is necessary

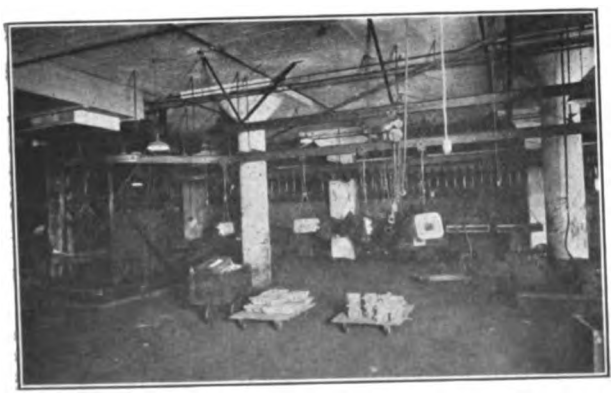


Fig. 7. Mechanicalizing paint dipping operation is a recent installation at the Brown & Sharpe Manufacturing Company.



Fig. 8. These four trucks show the similarity in design for handling different products.

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to try and fit each part so that the final unit is absolutely accurate. The handling of these highly machined pieces has caused the company to develop a number of hand trucks with special super-structures, also a number of special tote boxes which are used for the handling of parts from operation to operation.

A few of the special trucks and tote boxes mentioned in the previous paragraph are shown in Figs. 8, 9, 10, 14, and 15. It will be noted that the majority of trucks are the balanced or six-wheel caster type, although, as shown in Fig. 10, the use of lift truck platforms is now being considered. The advantages obtained by using these special trucks are manifold. First, they prevent damage in handling; second, they assist in counting the number of parts on each truck; third, they serve as a clean storage unit for the parts from the time they start in process until they are assembled into a finished machine; fourth, they permit short movements without the necessity of using other equipment. Although the loads carried by these hand trucks frequently amount to several hundred pounds, one man can move them with ease.

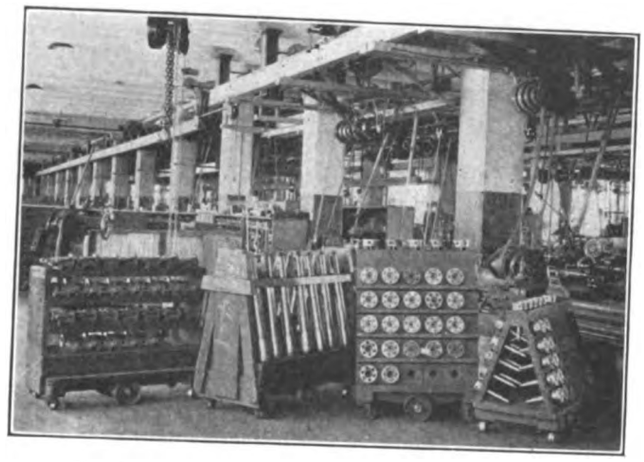


Fig. 9. Trucks of this nature make handling easy and also assist in many other ways.

Departmental handlings are all done by individual department employees, but inter-departmental transportation is accomplished by a centralized department. This department operates over schedule routes, and these schedules are maintained as close as possible, although frequently emergencies arise which require the schedules to be broken. When the inter-departmental system is working according to schedule, the trucks pass over a definite route at specified times so that department foremen can route their outgoing materials in advance. These are placed in outgoing bays marked on the floor, as shown in Fig. 13. Alongside of this bay is an incoming bay where the trucker can leave any material which he is carrying to be delivered to this department. The picking up and dropping of the loads at designated stations eliminates a great deal of trucking delay and permits quicker handling.

For the handling of small parts, tote boxes or trays have been found best and it will be noted that one tray or tote box will carry a considerable number of parts. The parts shown in Fig. 14 are for clippers and each tray is designed to carry a particular part. Frequently one tray will carry enough parts for from one to one hundred clippers, and as each part is different, the trays must be designed accordingly. Fig. 11 only illustrates a few of the special types used in the clipper department. Other special ones have been designed for the gear cutting and other small parts departments.

In visiting other plants, the writer has noticed the extensive use of tote boxes, and frequently this equipment has presented a difficult problem in housekeeping, as usually any quantity kept within a department were placed on the floor

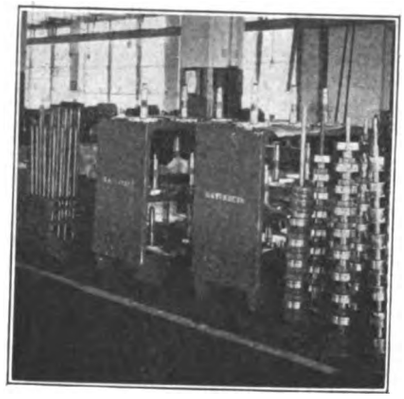


Fig. 10. Hand lift trucks have caused skids to be built for handling certain parts. Note the spindles of finished gears and cans.

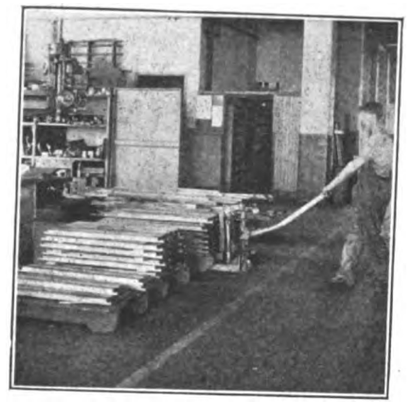


Fig. 11. The lift truck and skid method of handling has been found advantageous on certain transportation operations in various departments.



Fig. 12. Safety in the transportation department is given every consideration. Note the truck handle painted white to prevent tripping should it fall in this position.

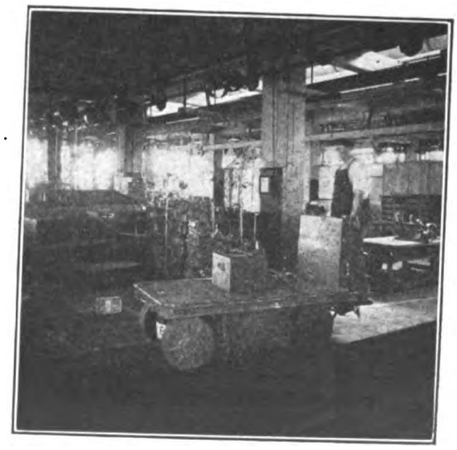


Fig. 13. This is one of the pick up and drop stations of the inter-departmental transportation system which uses electric industrial trucks for the carrying medium.

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in a haphazard manner. Fig. 16 shows a neat way of placing tote boxes in racks after they are received at the assembly or finishing departments. This method not only makes it possible to store more in a given space, but also eliminates considerable handling and rehandling when looking for a particular box. Housekeeping is an essential factor in a good materials handling system. By allotting a definite space for transportation and the storing of materials within departments, many small difficulties can be easily eliminated.

The Manufacturing Departments of Brown & Sharpe are really separate individual shops all within one plant, and for this reason every type of machine tool manufactured in any quantity is assembled within its own production department. For example, Fig. 17 is taken in the No. 2 Universal Milling Machine Department on the third floor of Building 4. Here a number of machines are in the process of assembly and on this same floor all small parts for these machines are made. As the movement for handling in this type of department does not require speed, we find hand operated cranes equipped with trolleys and chain hoists running the full length of the department. Occasionally air hoists or electric hoists are used instead of chain hoists. After the machine tools are assembled, and even during the process of assembly, it is necessary for the inspectors to give them close supervision. If it was necessary to move each machine to the inspector there would be considerable handling, but due to the prevailing use of caster trucks, all inspectors have a portable office as shown in Fig. 18. This permits the inspector to go anywhere within an assembly department.



Fig. 14. These are only a few of the many different types of tote boxes and special trays designed for handling highly finished parts.

The layout of assembly departments makes it necessary to rehandle every finished machine, and this handling is done on four-wheel platform hand trucks. The loading of these trucks is done by department cranes and the trucks are then lowered to the crating and shipping department on platform freight elevators. As there is no railroad siding, all equipment has to be loaded onto motor trucks or wagons for transportation to the shipping terminal. This loading is accomplished by a large electric hoist suspended directly over a large platform scale. Here all machines are weighed, marked, and immediately loaded for transportation to railroad or boat terminals.

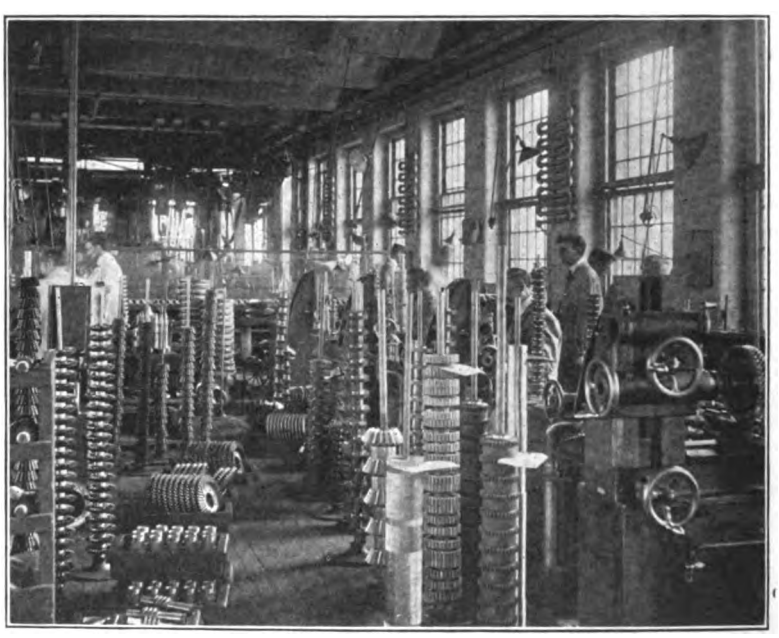


Fig. 15. Machine parts of this nature require careful handling and the spindle has been found most satisfactory from several angles.

At first, one may not be impressed with Brown & Sharpe's transportation system and handling methods compared to many newly installed systems, but by giving careful study to the products manufac-



Fig. 16. When tote boxes are used in large quantities it is necessary to provide racks for storage purposes within departments.



Fig. 17. This is the general view of a machine tool assembly bay. The readers' attention is directed to the method of operating a crane over the jackshafts.

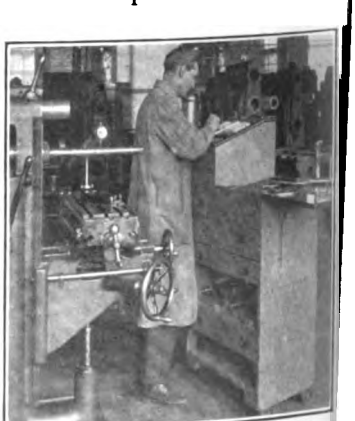


Fig. 18. The use of caster truck is so general that the inspectors have portable offices on this equipment.

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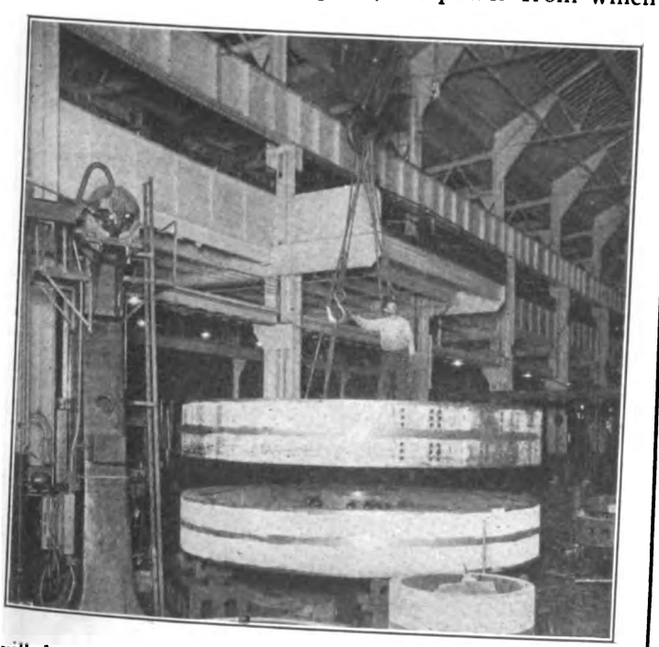
tured and the number of different parts which necessarily must be handled, we find that their methods are well adapted to their particular requirements, and work out very satisfactorily. No doubt many other manufacturing plants of a similar nature could use these same methods. The outstanding feature in this plant is the proper coördination of hand handling methods and mechanical handling methods. A system which properly balances these two divisions is generally difficult to maintain, and for this reason we feel that the methods used in this plant are worthy of comment.

No doubt many improvements, and possibly entirely different equipment, could be used if a new plant were being designed for this class of manufacture, but all companies cannot afford to scrap existing plant buildings in order to modernize their transportation or materials handling methods. It is sufficient proof of progressive management when this subject is being given consideration.

How Large Generator Rotors are Made

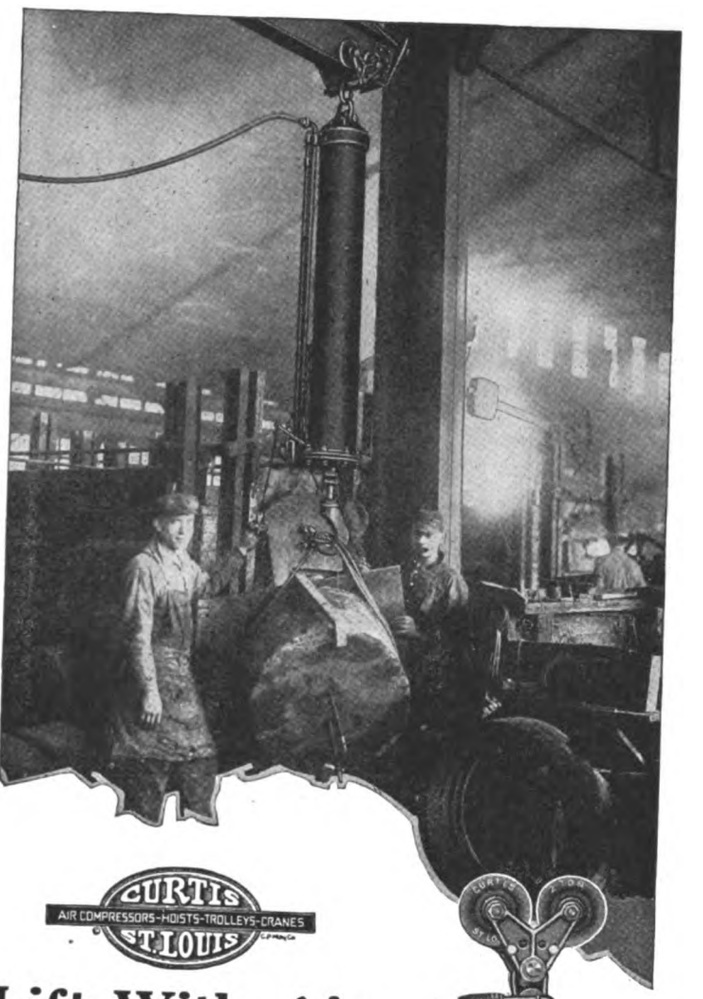
SOME of the generators made at the General Electric plant at Schenectady are so large that two or more rotor wheels are assembled on one shaft to provide a rotating element of sufficient size. The accompanying photograph, taken in one of the large G-E machine shops at Schenectady, shows the assembly of two rotor wheels for a 22,000 kilowatt water-wheel driven generator.

The generator when completed will be installed in a large hydro-electric power plant, the power from which



will be used for industrial purposes. This generator will be the largest of its kind ever built for this purpose by the General Electric Company.

The practice of building a rotating element in two or more sections and assembling on a common shaft is not new. It is more or less common on large machines, being easier for manufacturing reasons. The two wheels shown in the photographs will first be bolted together and later keyed to the shaft. Their total weight, with the shaft, is about 265,000 pounds, or 132½ tons, and their diameter is about 19 feet.



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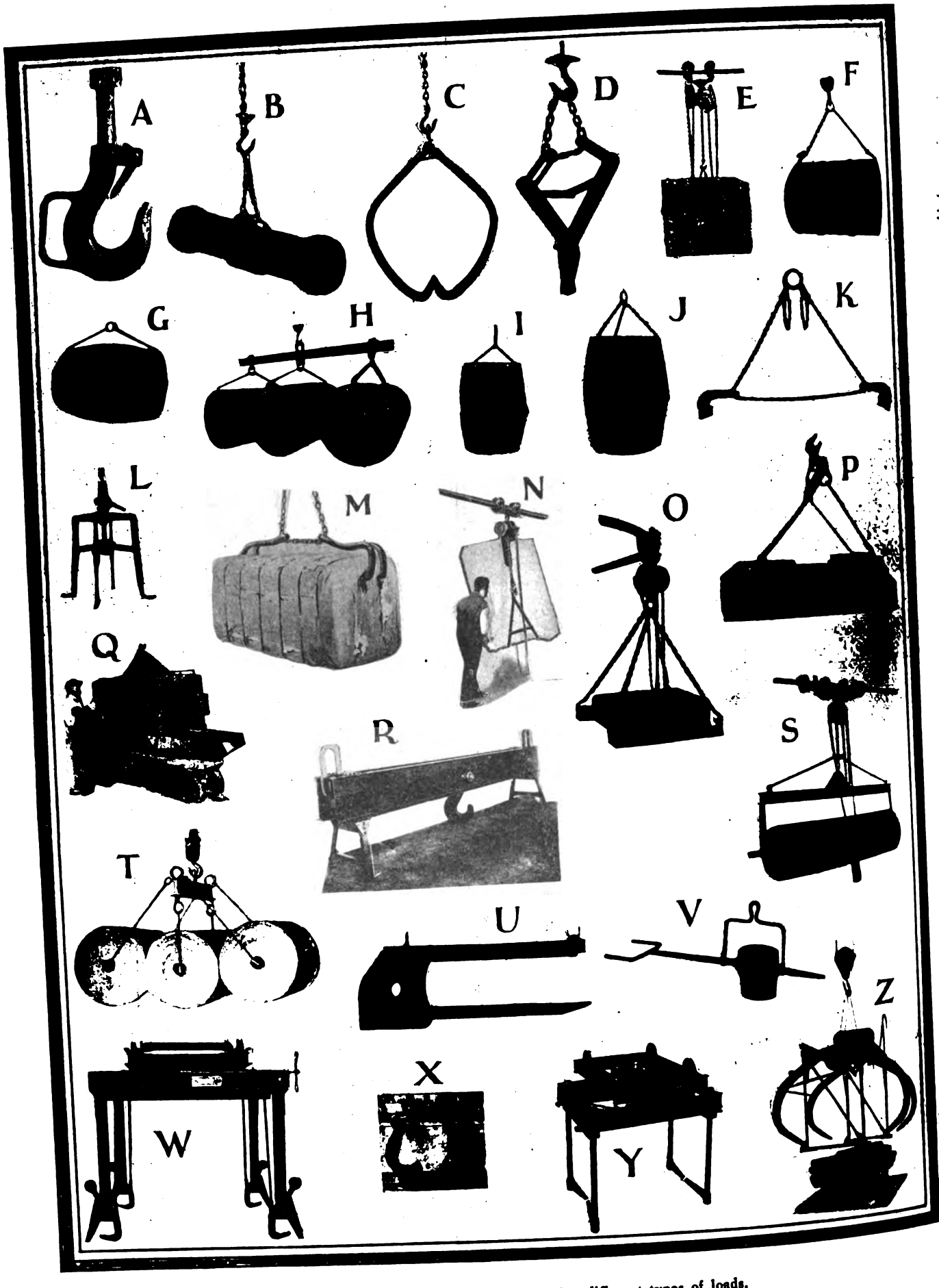


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Showing methods from A to Z for lifting different types of loads.

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What's Under the Hook?

Buckets, Slings, Grapples, and Their Uses

MORE and more, manufacturers of cranes, telphers and various types of hoists, including air, electric and hand, are beginning to realize that proper operation of their equipment and its adaptation to certain industrial handling operations depends largely upon "What's Under the Hook?" The various accessories that have been developed by users and manufacturers have greatly increased the usefulness of all types of materials handling equipment that can be installed for lifting loads. These accessories include buckets, tubs, skips, nets, cinch boards, baskets, electric magnets, grapples, tongs, grab hooks, slings and other devices. To show all the various types would be impossible, and many are only known to the users as they are not considered important enough to broadcast their development to the industrial field. In this article we have tried to assemble a number of well-known and special attachments, and at the same time show them under actual operating conditions in industrial plants.

Without any difficulty a controversy could be started as to which is the proper type of bucket to use in connection with different types of cranes. This is a subject which in itself could form the basis of an article, as many engineers and operators have different opinions, frequently using different types of buckets for handling the same material. Suffice it to say that buckets of various designs have been developed, and these may be divided into four classes or types: grab buckets of the clam shell, orange peel or scraper design; drag line buckets; turnover buckets; and bottom dump buckets. All of these may be used successfully on any machine having one or more hoisting lines. They are especially adapted to such service as handling fuel and ashes in power plants, in foundries, or

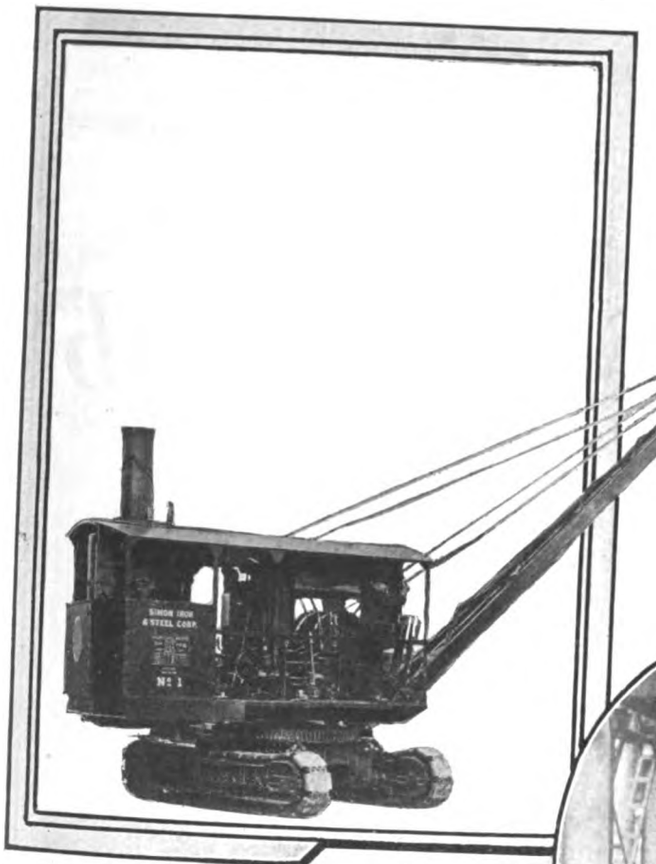


Fig. 1. The well-known type of grab bucket used for handling bulk material.

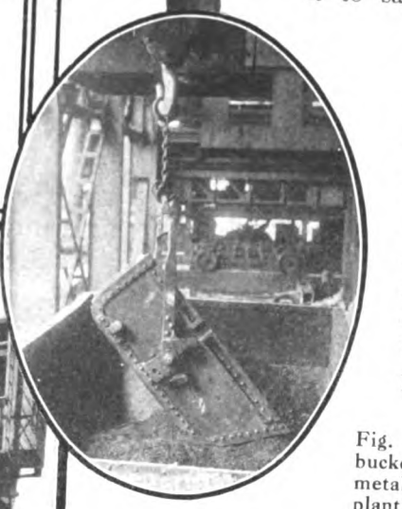


Fig. 2. Self-dumping side discharge bucket as used for handling scrap metal and bulk materials about the plant. Note the safety handle on the chain sling hook.



Fig. 3. To weigh and lift in one operation generally eliminates one handling and saves time. This shows one method and installation where the crane operator is also the scale man.

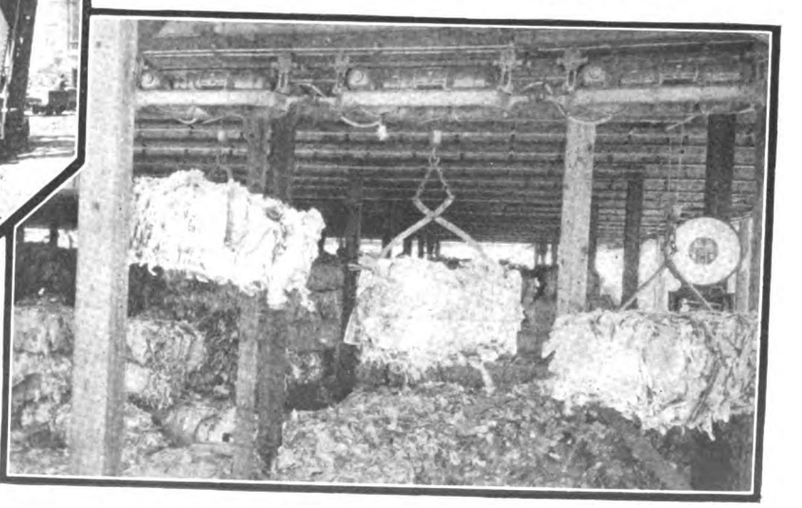
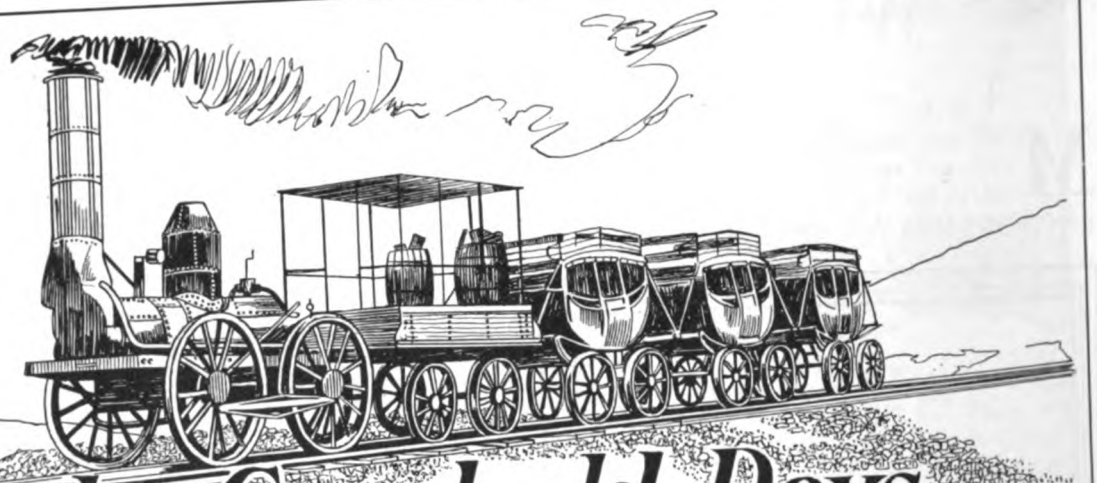


Fig. 4. Standardization of hooks and grapples has not yet been reached. In this one illustration, three distinct types are used on the same operation—that of handling bale paper.

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In the Good old Days of "Rule of Thumb"

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other operations where loose material is handled. Electric magnets are also gaining popularity for the handling of all types of metal and metal parts. The most common type of magnet is the round, flat type, although many rectangular and special magnets have been built for handling pipe, bar stock and steel plate. The use of lifting magnets makes it possible to handle large quantities of metal not easily nor safely handled by any other means. A magnet will operate under practically any weather conditions and will handle metal in practically any state.

In order to grip some loads, it is necessary to use an internal grapple, and one of the simpler types is shown in "D," another type is shown in "L." The latter type is illustrated in actual operation in a large wire mill which is equipped with machinery for stripping blocks (see Fig. 5).



Fig. 5. Block stripping in wire mills is a difficult handling operation. A proper device under the hoist hook is an aid to production.

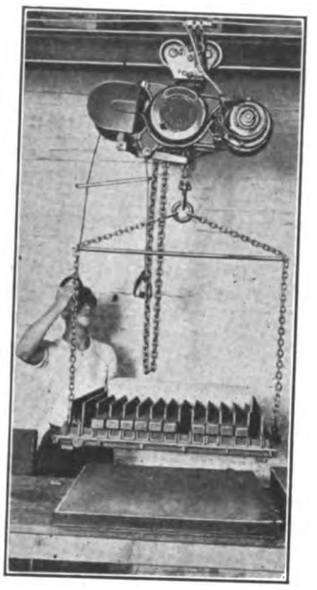


Fig. 6. Providing a spacer between the sling chains will make for even distribution of the load.



Fig. 7. When a number of handlings have to be made, it is always well to design a special attachment to fit the job.

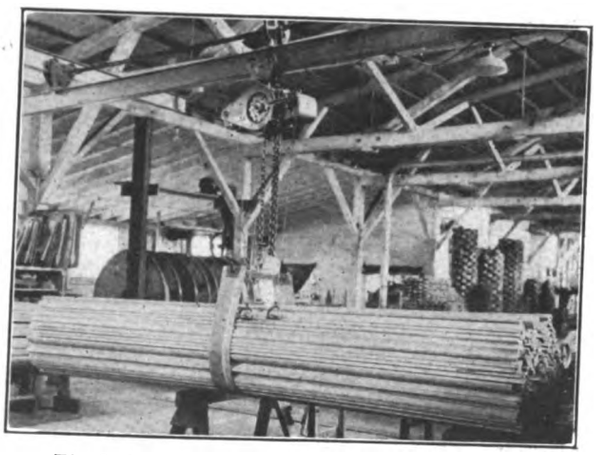


Fig. 9. A chain, wire, or rope sling would damage this material, but by using a wide strip of rubber belting with the proper support under the hoist hook all chance of damage is eliminated.

When the wire comes off these blocks it is hot, weighs 300 pounds and is very difficult to handle. The electric hoist and cranes themselves materially assist and are necessary but by having a proper device under the hoist hook, the efficient use of the overhead equipment is insured.

Many types of chain slings are now being used in practically every industry. "B" shows the simplest type, consisting of two chains swung around the piece being handled. "E" shows a chain sling for general merchandise and "I" shows how the same sling can be used for handling a barrel in the upright position. With this sling the chain goes entirely around the sides of the load and two sides are connected by a chain running up over the top of the load into which the lifting hoist hooks. This sling is made in one piece and, in attaching to the load, is thrown over the top and around the sides, where the two connecting ends are hooked together. With this arrangement, the heavier the load the more tightly the chain sling draws around the article being lifted. The combination chain and bar sling for handling barrels is also shown in "J."

Other combinations of chains and hooks for the slinging of loads are illustrated in "K," "M," "O," "P" and "X." Here various attachments or hooks are fastened to the chain, thus making a chain sling grapple. The sling shown in Fig. 3 is a two-chain sling with the addition of a spacer bar to keep the chains away from the product being handled. The use of a spacer bar in chain swings will often make it possible to handle loads in this manner that could otherwise not be taken care of.



Fig. 8. At one time artificial ice was lifted from the refrigerating tank one can at a time. By applying the proper attachment under the hook, three cans are now lifted, thus reducing handling costs.

When a number of handlings have to be made of the same container or similar parts, it is always well to design a special attachment to fit the job. For this reason, the manufacturer in whose plant Fig. 7 was taken designed this grab for lifting baskets of parts into and out of the annealing furnace. Formerly, artificial ice was lifted from the refrigerating tanks one can at a time. This necessitated the crane and the operator making many unnecessary trips to the dump-out point. In the past few years improvements have been made in refrigerating plant operation and due to competitive business every handling cost has been scrutinized. What

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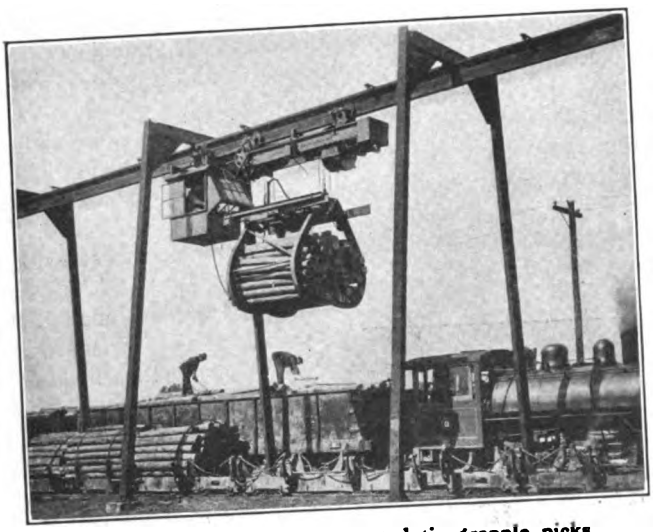


Fig. 10. This motor operated tie grapple picks up unit piles of ties, transporting and placing same on special cars for creosoting. It is also used for loading and unloading cars.

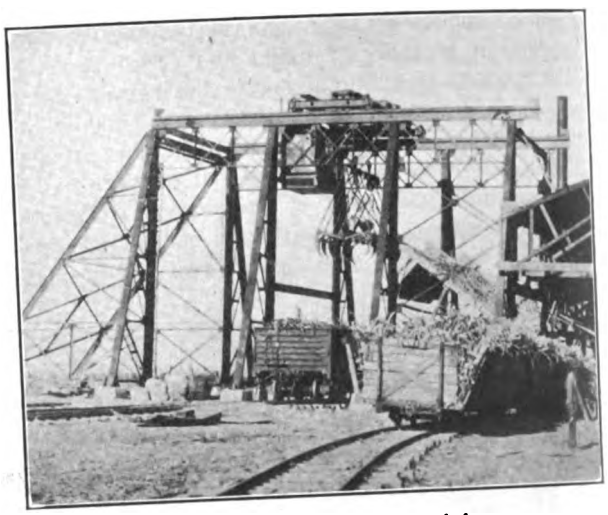


Fig. 11. This fork grapple is used for unloading sugar cane from cars to mill. It has a direct bearing on production costs.

is the result? It has been found possible by applying a proper attachment under the hoist hook to handle three cans at a time (see Fig. 8), thus reducing handling costs and materially speeding up the operating time.

Similar slings to the one shown in Fig. 9 are also used for handling highly polished or cut stone, it being easier to do this than take a chance on protecting the material by padding the chains or ropes. The handling of large slabs of glass and marble or other similar materials, both on the lifting and transporting operation, has always presented a difficult problem. The grapple shown in "N" was developed for the marble industry and has proven very successful. It consists of a metal frame supported from the hook and an additional wooden strip with cleats which slide up and down the hoist chain. This cleat supports the load at the top and prevents tipping. Many other handling problems can be solved in a similar way by taking advantage of the hoist chain providing the load does not throw the chain out of plumb.

Cinch boards and skips are generally used with derricks or cranes for handling brick, stone or other materials in construction work and, at the same time, they are used in industrial plants for handling boxes, chippings, miscellaneous parts, etc. One form of cinch board being handled by means of a chain sling is shown in "O" and is handling stone. It will be noted that the chain hoist does not fasten the load to the board, and for this reason it is recommended that when handling boxes by this method,

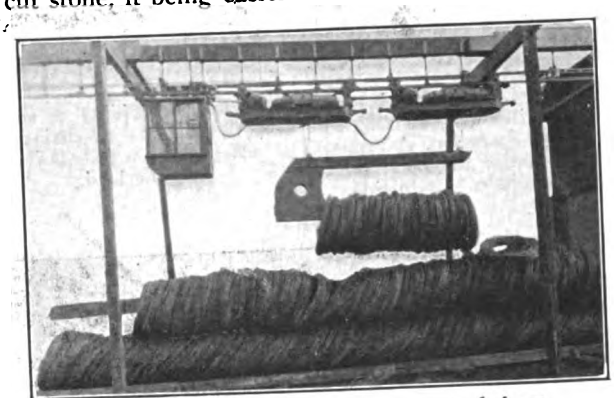


Fig. 12. This hairpin hook supported from two monorail hoists has been found very advantageous in handling coils of wire.

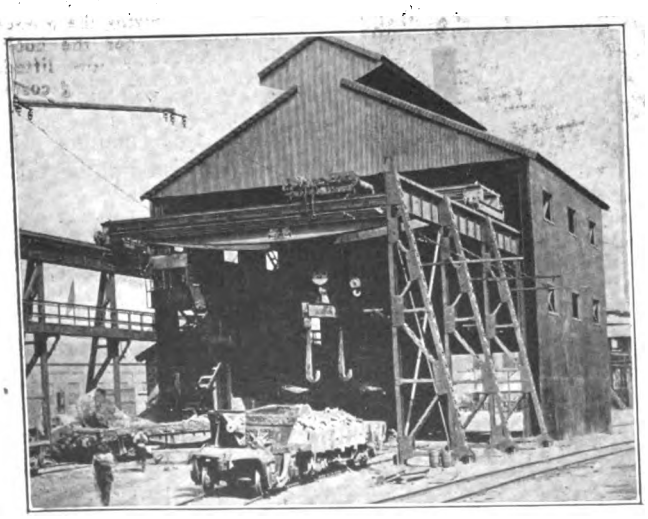
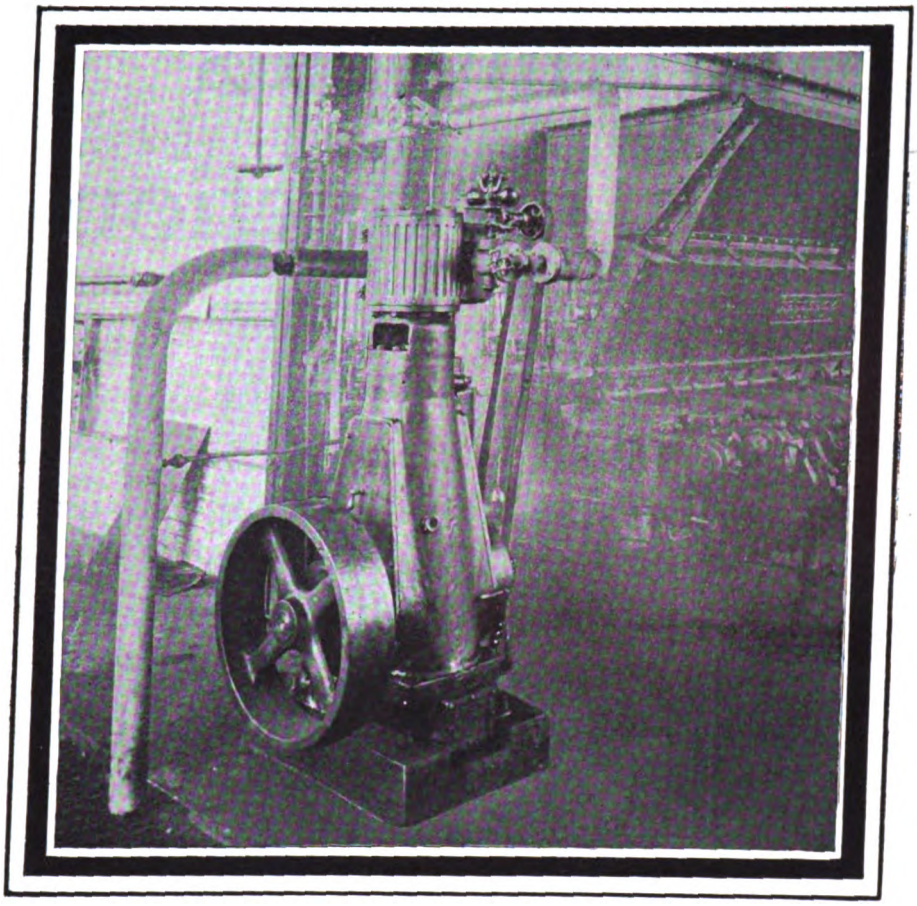


Fig. 13. The ladle hook is neither a part of the ladle nor a part of the crane but is an accessory. It permits the use of one hook for many ladles and, at the same time, makes it possible for the crane to be used for other work.



Fig. 14.—When handling such loads as locomotives, the use of equalizer beams distributes the load on the crane and permits the proper attachment to the load itself.

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either wire rope or manila rope sling be used, in which case rings for the slings should be provided at the four corners. In operation, when thus equipped, the boxes are first loaded on the board and then the rope or sling is brought up over the material. One part of the rope on each side is put over the hoist hook and as the cinch board with its load is lifted the other part of the rope at both sides tightens over the load, holding it securely in place.

Certain operations demand special slings or hitches which cannot be used for any other purpose. "V" shows a simple device for handling a small ladle in foundries where overhead I-Beam trolleys and chain hoists are used for lifting and transporting hot metal. "Q" shows a rather cumbersome but effective device for handling and transporting sheet metal by crane from stores to operating location. The sheet metal is picked up in the angle iron frame by bringing the sides together by means of the screw arrangement in the man's hand. This would be known as a special device and is a development of this particular plant. The handling of ties and sugar cane seem to be very far removed from each other and yet grapples are used for both in the loading and unloading of cars. Fig. 10 illustrates how the Michigan Wood Preserving Company uses a motor equipped tie grapple to pick up unit piles of ties, transport and place them on special cars for creosoting. Another type of tie-grapple is shown in "Z." It will be noted that there is similarity between the tie-grapple and the grapple used by the Salisburg Refining Company for handling cane sugar from cars to crusher, as illustrated in Fig. 11.



Fig. 15. Special carrier frames are important wherever loads have to be lifted or transported by means of hoists, cranes, monorails and telphers.

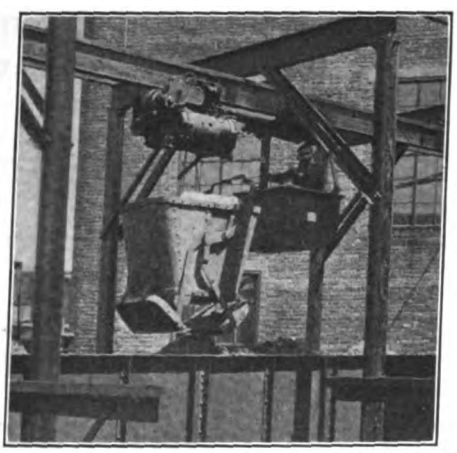


Fig. 16. This bulk discharge center-opening bottom-dump bucket with extended-and-cross-bar-lever permits the telpher operator to discharge the load directly where he wants it.

While it is necessary to have the proper attachment under the hook, it is also equally important to operate the crane properly when lifting the load so as not to put undue stresses and strains both on the crane itself and the sling and hitch being employed. Too often chances are taken in estimating the weight of materials to be handled by slings and cranes. All crane and hoist operators should be instructed that if there is any possibility of overloading, or if there is any doubt as to the weight of the piece to be handled, they should consult the foreman who will have the weight calculated for them. Chain hoists especially should not be overloaded beyond their rated capacity, for that will cause the links in the chain to kink and bind. Hitches should never be made by using the hoist or load chain and hook, for that causes kinks in the chain and weakens the hook. Other precautions are: Never use a chain if the links do not work freely one with another since such chains have been overloaded or misused. When a sling or hitch is badly worn or bent, scrap it and obtain a new one. Use neither wire nor manila rope that has become badly frayed or worn in spots, and never use a wire rope that has a sharp, fixed kink. For the industrial executive to insist on this procedure in all cases where slings or hitches are being used will result in a considerable money and time saving, as well as a safety precaution.

The foregoing description and illustrations show a small part of what has been done on the important subject of placing the proper attachment under the hook, but there is still room for improvement and this work must be done by the equipment manufacturers as well as the users.

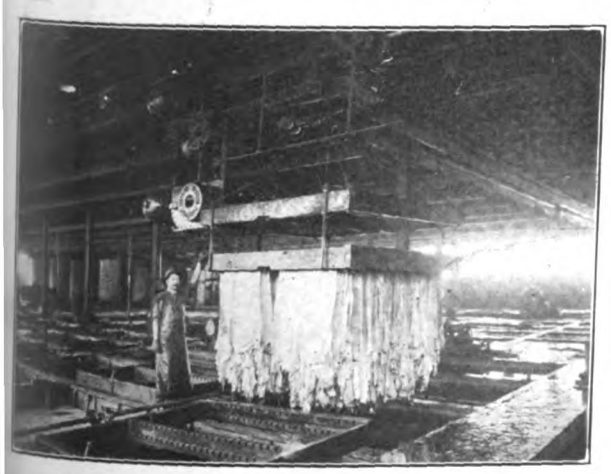


Fig. 17. Handling hides of leather in processing has been simplified by the use of crane attachments, similar to the one shown above.

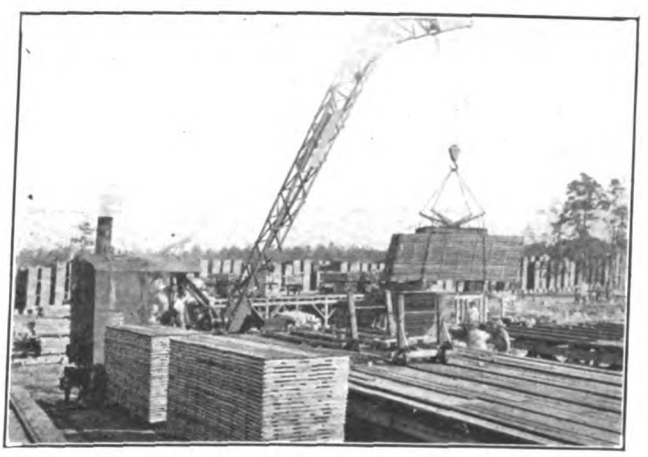


Fig. 18. This is one of the many types of attachment that can be used for handling piled lumber by means of a locomotive crane.

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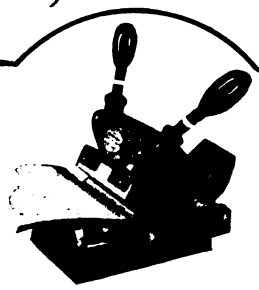
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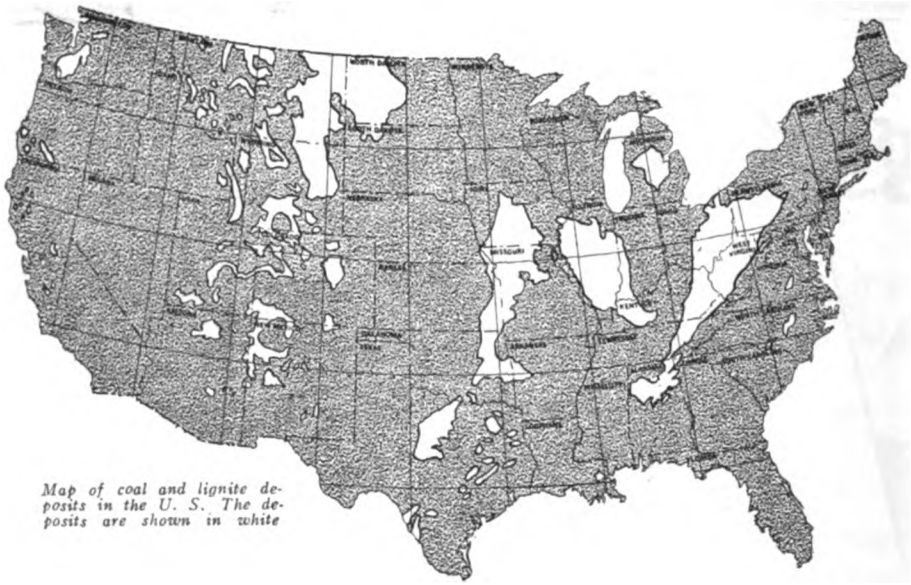


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In doing this he draws upon a vast fund of data secured in solving hundreds of similar problems. Therefore the recommendation he makes of a certain type of furnace and mechanical stoker installation is based on its known ability to burn the cheapest local steam coal at highest efficiency, and to effect also a predetermined saving in labor costs.

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Fitting Handling Methods into the Existing Plant

The Crompton & Knowles Loom Works

IN manufacturing Crompton & Knowles looms the materials are received in a raw state and shipped out as complete looms ready to operate. For this reason the plant consists of foundries, machine shops, forge shops, woodworking shops and assembling departments. As all of these departments are multiple floor and inter-departmental transportation is necessary, we find the buildings connected by bridges so as to facilitate transportation on different floor levels. This plant produces complete looms for manufacturing all fabrics from silk to carpet. Due to the various size looms and special requirements for the textile trade, the handling of thousands of miscellaneous parts and a number of complete machines in production presents a difficult handling problem.

Every day hundreds of patterns are sent to the foundries and hundreds more are received back from the foundries to be placed in storage. The last inventory of patterns shows that over 500,000 were stored in a three-story concrete building built especially for this purpose. In this building platform hand trucks and stevedore hand trucks are used for transportation.

The foundries of this plant are unique as the heavy castings are molded and poured on the first floor, while the smaller castings are molded and poured on the second floor. Two complete overhead monorail track systems are used for transporting the molten metal from the cupola to the mold. All raw materials for the foundries are unloaded direct from cars to storage bins. A monorail telpher equipped with a magnet used for unloading and handling iron and the same machine equipped with a clam shell bucket is used for unloading lime stone and coke. Sand is handled from the cars and distributed to storage bins by means of two portable conveyors suspended from I-Beam trolley track, which arrangement permits great flexibility.

Castings from the knock-out points are handled in wheelbar-

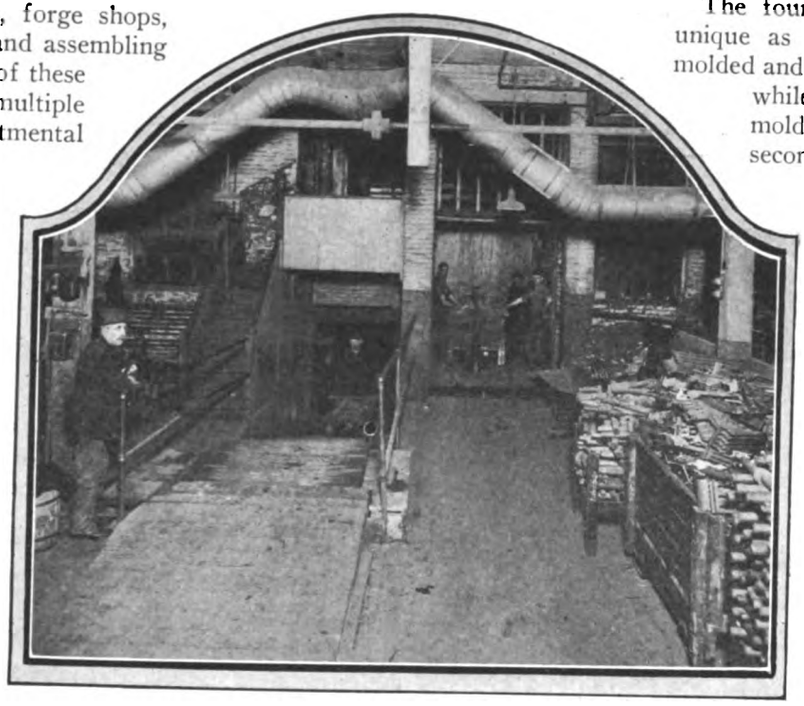


Fig. 1. For bringing castings from the foundry and the cleaning department, both a continuous conveyor and platform freight elevator are used.



Fig. 2. The handling of many small parts necessitates sorting and checking. This is a general view of the starting department.



Fig. 3. Letters A, B, and C show three operations on one forging. Note how raw material and finished parts are handled on skids.

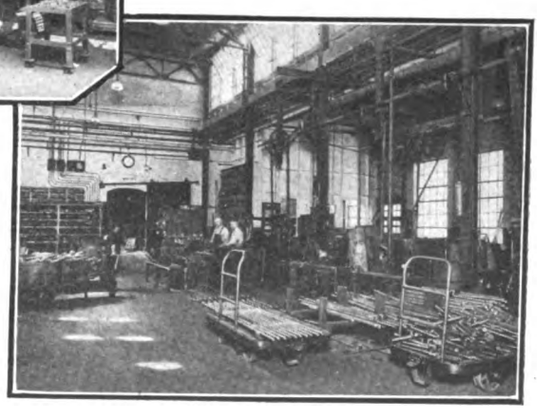


Fig. 4. For handling long forgings the tractor and trailer method is used.

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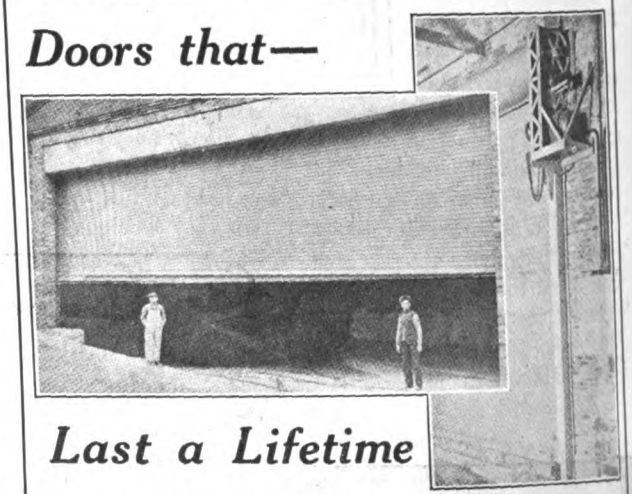
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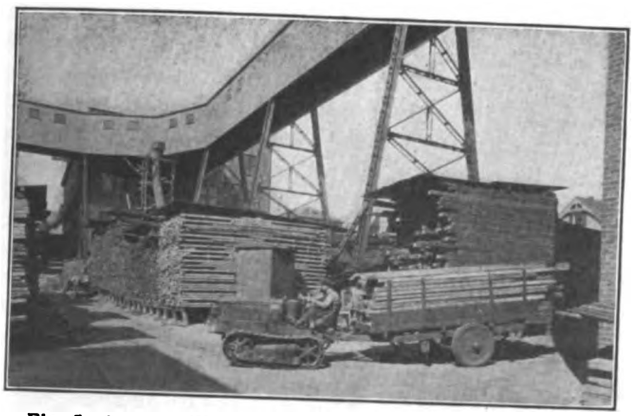


Fig. 5. A caterpillar tractor is used for transporting lumber in the yard. The bridge was built especially for electric trucks.

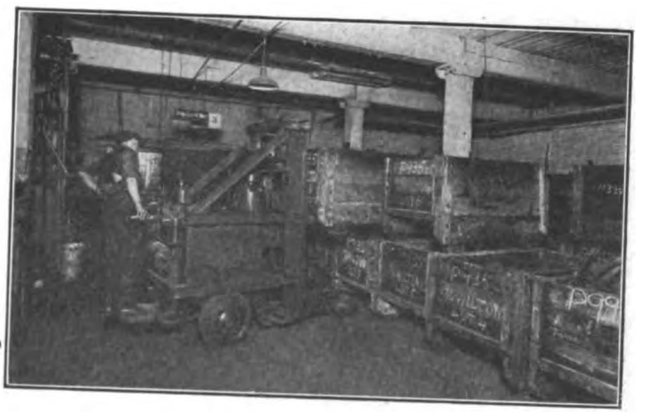


Fig. 6. In making up looms, it is necessary to consolidate a number of parts. This shows the method of storing these parts by lots in box skids.

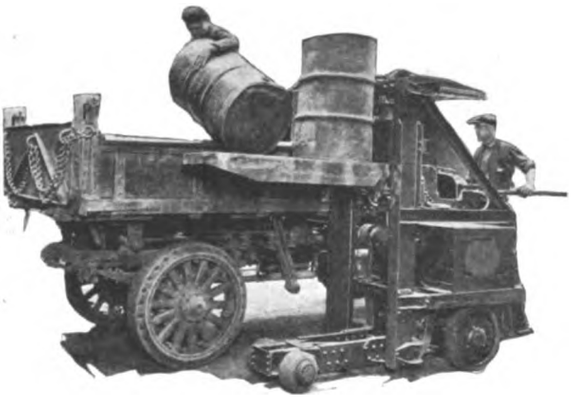


Fig. 7. This is another operation performed by the same electric truck shown in Fig. 6.

rows and by trucks to the tumbling and sand blast departments for cleaning. After passing through these departments, they are raised one floor (see Fig. 1) to the starting department, where they are weighed and routed through production. A considerable amount of the castings come through in relatively small lots and have to be segregated and distributed to the manufacturing department. This is the function of the starting department. A portion of this department is shown in Fig. 2. Here we see the small castings being sorted, counted, and made ready for distribution to stores or machine departments. Here parts are placed in tote boxes which serve as containers for particular lots. The number of tote boxes used in this plant is surprising, there being over 10,000 continually in use; six thousand of wood and approximately four thousand are steel.

In addition to the small castings, there are a number of large cumbersome pieces, such as loom frames and beams, which are very difficult to handle. A number of these pieces are quite heavy and make a good lift for two or more men, and for this reason the company uses an electric crane truck for handling these parts whenever possible. The use of a crane truck speeds up the operation of handling these awkward pieces and also reduces the accident hazard. The forge shop of this plant is a one-story building well equipped with the most modern machines. Due to the progressive steps in materials handling, which have been accomplished in other departments, before the forge shop was built, we find the manufacturing equipment in this shop laid out somewhat in relation to transportation and handling. For example, Fig. 3 shows the layout of a production unit for manufacturing a crank shaft, which is required in all looms. This operation is in the background and its sequence is marked "A," "B," "C." The raw stock for operation "A" can be seen neatly piled on lift truck skids. This stock is picked off the skid, heated and the first forming operation performed. It is then lifted to the second heating operation and the second forming operation performed. From here it goes to the final straightening operation marked "C," and the hot forging is immediately placed on an all-steel skid for transportation to the next operation. It will be seen with this layout all unnecessary handlings are eliminated. In this same photograph can be seen the method of placing pots in the furnace for the annealing furnace.

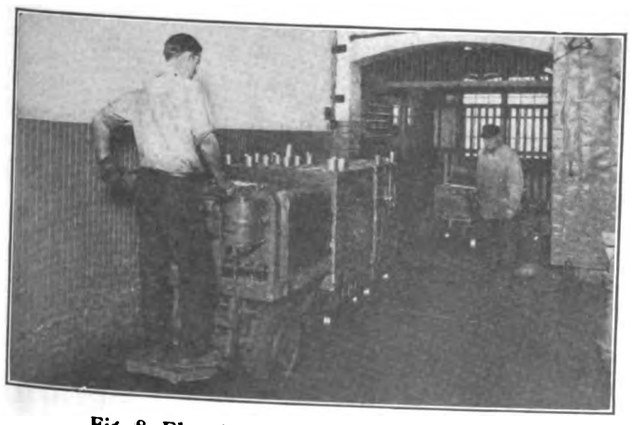


Fig. 8. Electric trucks are not permitted on the elevator. For this reason each elevator is equipped with a hand lift truck for transfer purposes.

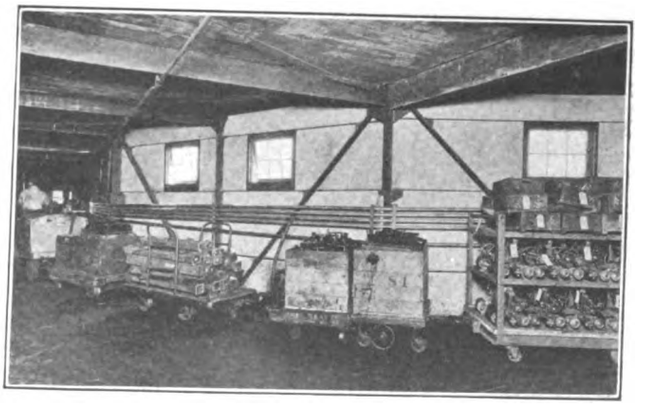


Fig. 9. This train is being pulled by an electric tractor passing over the bridge shown in Fig. 5.

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Hand lift trucks are used throughout this forge shop for making short hauls between operations and chain hoists on I-Beam trolleys are used for lifting heavy parts.

The lumber requirements of the Crompton & Knowles Loom Works make it necessary to carry a large stock of lumber for seasoning and because of the plant layout, this lumber storage is at two different points, which necessitates the crossing of a public street. The lumber yard on the plant side is paved with concrete in the roadway, but the main storage yard is of cinder fill. For this reason a crawler type tractor, as shown in Fig. 5, is used for transporting trailer loads of lumber from stock pile to kilns. This tractor will easily run over any obstructions and can operate on bad roads in both summer and winter.

Whenever possible, parts which are being held in storage awaiting requisition from the assembly floor, are stored in lots and placed in box skids, as shown in Fig. 6. These skids when loaded are quite heavy and as frequently a number are in storage at one time, it is necessary to tier them. The tiering truck is not kept busy just performing this operation and so many cases are being found for its services, one of which is shown in Fig. 7.

In developing a system or methods for the transportation of materials many other manufacturing operations are often completely revised and simplified. For example, Fig. 10 shows a live skid designed for assembling and transporting a particular type of machine unit. Formerly the assembling operation was performed at long benches, as shown to the right. The use of the skid not only reduces the assembling cost, but also eliminates handling and reduces damage to the assembled units both during handling and in transportation. While it does not always pay to design special skids, they have particular advantages and this plant has made a careful study so wherever possible and economical they have built special skid bodies that aid production. They have also equipped the majority of their skids with casters so that short movements can be made without the necessity of obtaining a lift truck.



Fig. 10. The assembling of certain machine units on skids was developed by engineers of this company to eliminate handlings and reduce costs.

In assembling rooms the looms are usually kept in lots and are assembled in order. The movement of an assembled loom used to be quite a task, requiring several men with crowbars and rollers and considerable noise and confusion. It was thought a more convenient method could be found for this operation, and the use of an electric tractor was suggested. At first this was considered impossible but by careful study of the problem and by designing special dollies, the tractor is now doing the work shown in Fig. 11.

There is one peculiarity of this plant, namely the fact that complete machines are assembled on the top floor of the building, instead of on the ground floor, as is the case in most shops. This brings about a different condition for loading and shipping. At two points, steel structures are built over the railroad siding as shown in

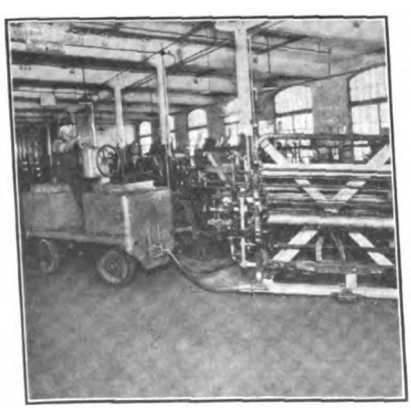


Fig. 11. This operation was at first considered impossible, but now the electric tractor can transport complete looms without difficulty.

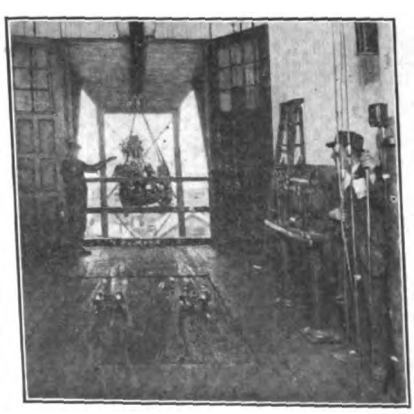
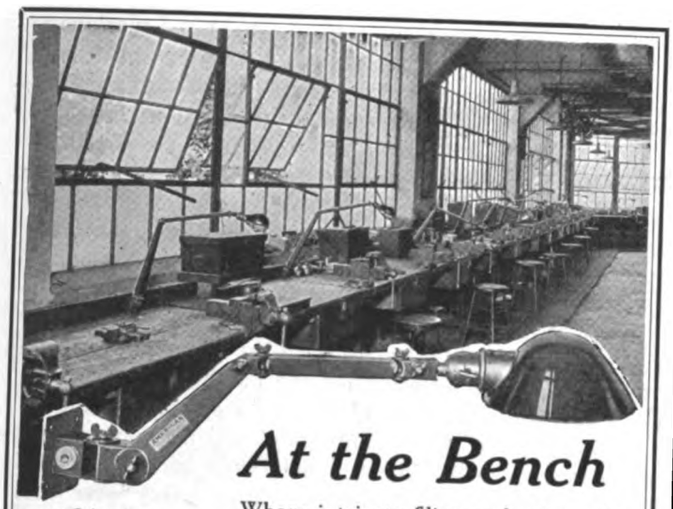


Fig. 12. Contrary to most shop practice, looms are assembled on the top floor. This illustrates the method of weighing and lowering to cars for shipment.



Fig. 13. General view of the charging room equipment required for the electric storage battery trucks.

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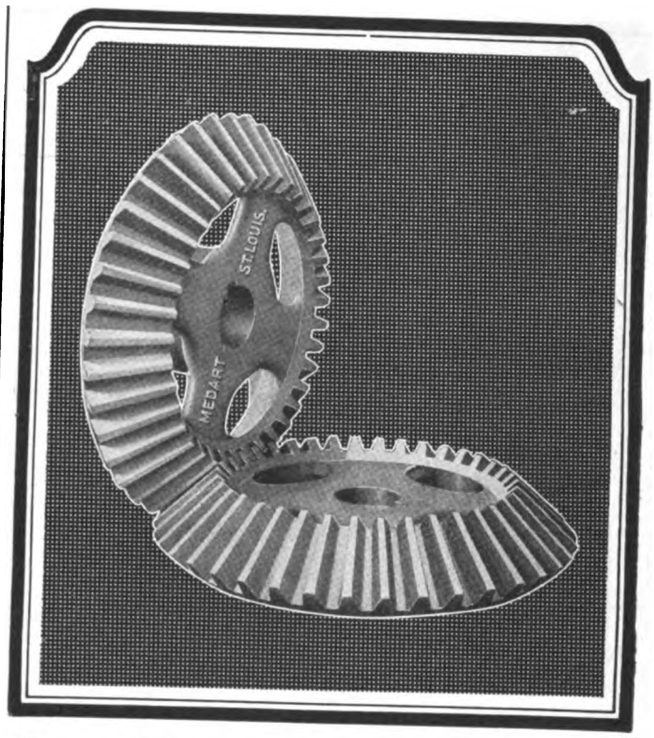
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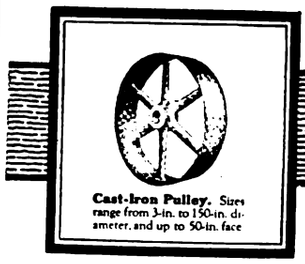
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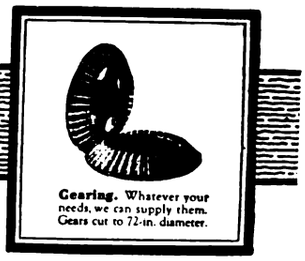
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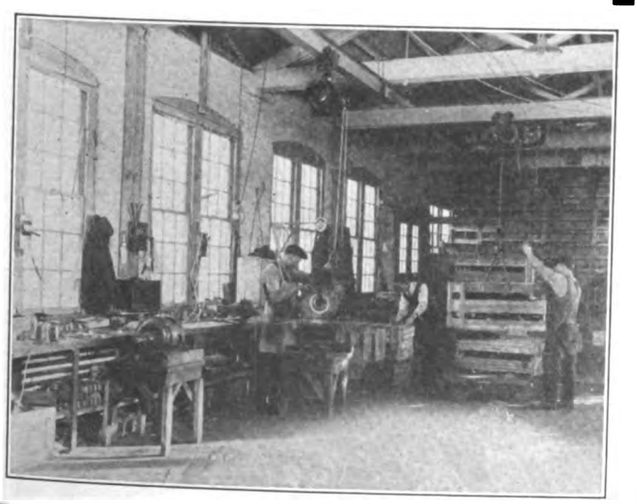


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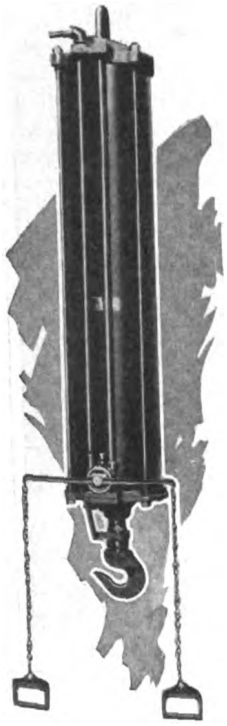
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Fig. 12. After the tractor has brought the machine to the scale for weighing, it is picked up by a cable hoist, which moves horizontally through a doorway, and then can be stopped in the proper position for lowering the box car or flat cars where the finished looms are properly placed or crated for shipment.

The readers will see that all this handling of parts and machinery by fast moving trucks and tractors necessitates constant supervision, and the proper layout of trucking aisles and the routing of materials. Mr. J. F. Tinsley, Vice-President and General Manager of this company, has a number of decided ideas on what he would do in connection with the handling of materials if he were building a new plant. He feels that continuous conveyors could be profitably employed if proper provisions were made for their installation. In plants where electric lift trucks and tractor trailer trains were employed he would make the system like a transcontinental railroad joining the two ends of the plant—the receiving room and the shipping room with the necessary branch lines feeding the other departments. Mr. Tinsley would also try to arrange the transportation of the greater portion of materials at night so that only rush material and emergency parts would be handled in the daytime, while the plant was in full operation. The above statements mark the trend of executive thinking on this important subject of materials handling. The next five years will no doubt show a complete revision of the present existing transportation and handling methods in a great number of industrial plants.

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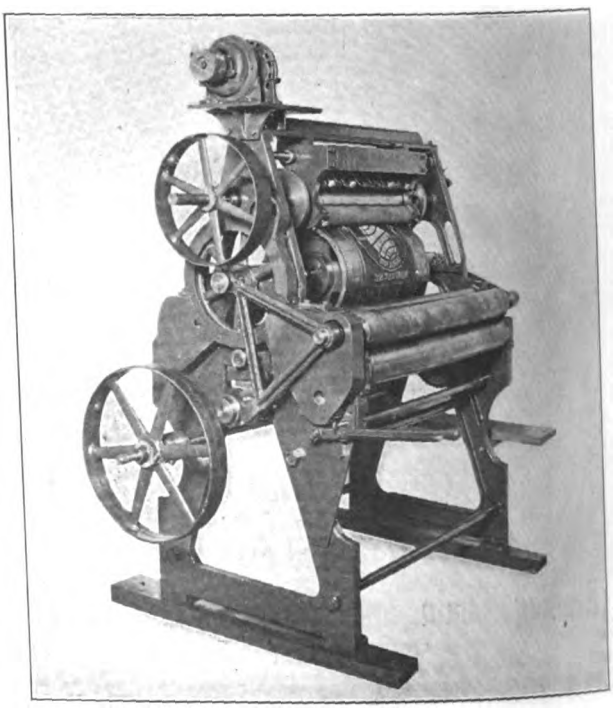
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THE Westinghouse Electric & Mfg. Company of East Pittsburgh is representative of some of the largest American industrial plants. It covers more than one hundred acres of manufacturing and office space and employs approximately 20,000 persons. The bird's-eye view in the large inset will give the reader some idea of the immensity of this plant. It would be difficult to write an article fully describing each department and operation in a plant of this size, so we are giving only a general cross section of the plant in order to show how materials handling equipment is being used and why. Many other types of equipment than those illustrated are also employed, but the essential points have been covered showing different departments and methods of handling and transporting materials.

While this plant manufactures only what might be designated as electrical products, it cannot be called a standardized routine industrial plant for the simple reason that here under the one management such products as radio tubes, steam turbines, motors ranging from 1/100 to 20,000 hp., generators from 1/10 hp. to 100,000 hp. capacity, transformers ranging from ¾ to 23,000 kva. and electric locomotives weighing 275 tons are being built at times during the year.

With this wide variety of products and a plant consisting of a number of separate buildings and departments, it is important to have a complete transportation system for both departmental and inter-departmental handling of materials. For this reason the East Pittsburgh main, works of The Westinghouse Electric & Manufacturing Company has a Transportation Department which comes under the direct supervision of the Supervisor of Transportation. This department of Transportation has its jurisdiction equipment used in handling of materials between departments and certain equipment used within departments. This department is divided into four distinct



Fig. 1. One of the large working bays fully equipped with overhead cranes, jib cranes and various types of hoists for lifting and handling. Note the truck aisle maintained through the center.



Fig. 2. This combination is seldom found. Note the proper coördination of overhead crane, industrial railway and freight elevator for the handling of material.

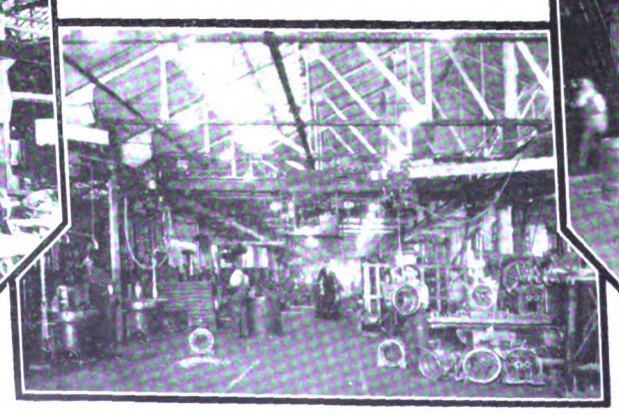


Fig. 3. By using steel skids, as shown, the crane is able to handle this class of material without danger of damage.



Fig. 4. In the indus department shown, hoists, electric hoists overhead cranes and dustrial lift trucks, the handling of m process.

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Fig. 2
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Fig. 5. The electric lift truck and skid method of transportation has its place in departmental handling. Note the special skids designed to carry work in process.



Fig. 6. Whenever electric lift trucks are used, it is well to have hand lift trucks for short movement of skids if necessary.

sions, which are: the broad gauge railroad; the narrow gauge or industrial railway; electric industrial trucks; and automobile road trucks. The Transportation Department has direct charge over all such equipment except when certain pieces are assigned for definite department handling. Such pieces then come under the jurisdiction of the department foreman until the work is completed, when again the Transportation Department takes control.

When we realize the number of different operations being performed in this plant and take into consideration the fact that they are continually changing, it is not surprising to find that practically every type of materials handling equipment has been, or is being used, for transporting, lifting and moving materials.

What is possibly the largest single area in the world contained all under one roof and all devoted to manufacturing is shown in Fig. 1. This large shop at the East Pittsburgh Works is 70 ft. wide, 1,610 ft. long and is fully equipped with overhead traveling cranes, jib cranes, electric hoists, air hoists, etc., for the lifting and transporting of materials. In addition, it is crossed at several points by industrial railway tracks and the broad gauge railroad enters it at both ends. A definite trucking aisle properly marked on the floor can be seen through the center, and this main aisle is intersected by cross aisles several times the length of the building. There are several other aisles in the works almost as large as this one, and they are all as well equipped but in each aisle a different class of products are manufactured.

It is seldom that a complete operation, such as that shown in Fig. 2, can be obtained without a set up, but this photograph was taken while the equipment was in operation. Here three distinct types of handling equipment are properly coordinated. The finished motors are being loaded onto industrial railway cars which will be pushed to the freight elevator in the background and lowered to the main floor for transportation to the shipping department. We wish the reader to note that industrial railways in this plant operate not only on the main, or



Fig. 7. This is the panel or control testing department; and even here mechanical handling facilities are provided for the inspectors.

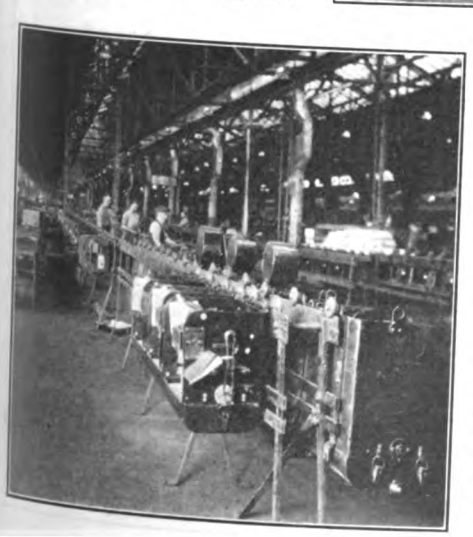


Fig. 8. These racks were designed to eliminate unnecessary handling during the assembling of controllers. They have been found very successful.

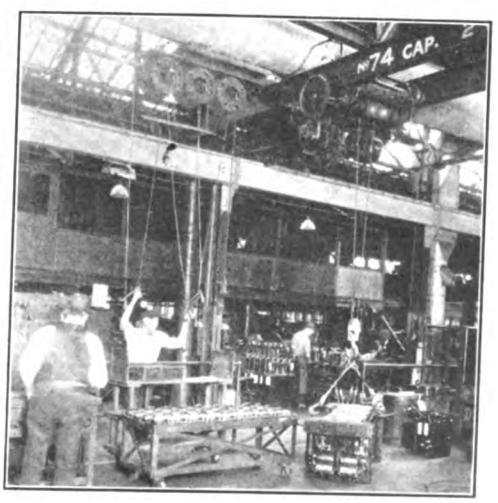
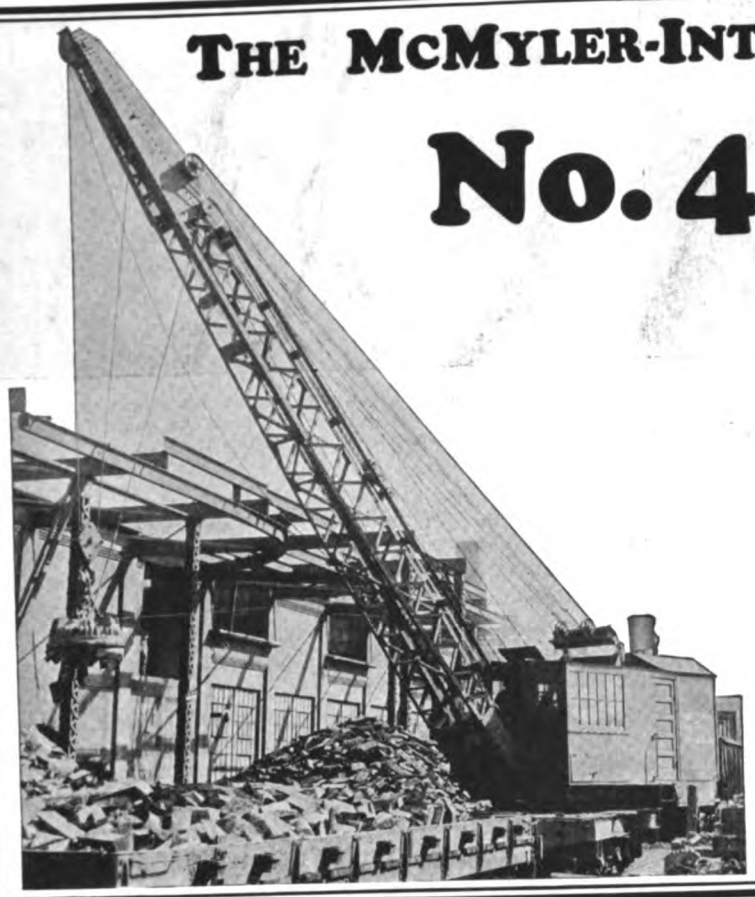


Fig. 9. The handling of electric control devices would be difficult, due to their awkward size and shape, if electric cranes could not be used. Note the under-slung trolley on this crane which permits operation under low roof trusses.

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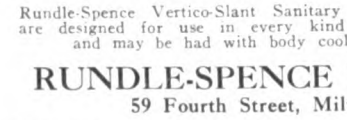
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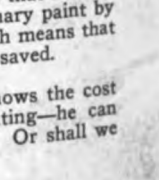


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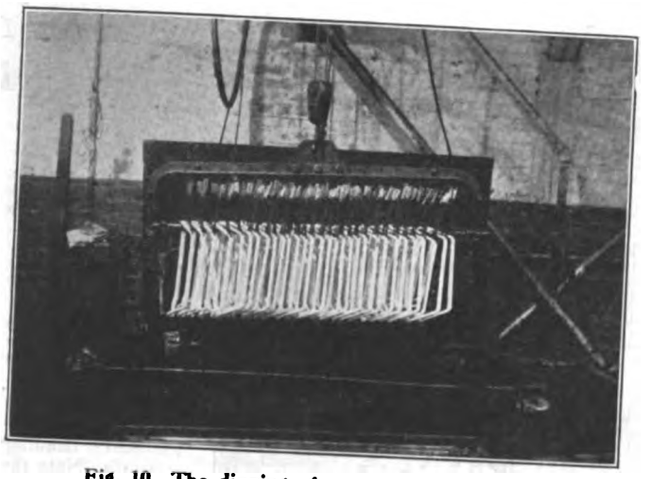


Fig. 10. The dipping of armature winding is made easy by the use of an air hoist.

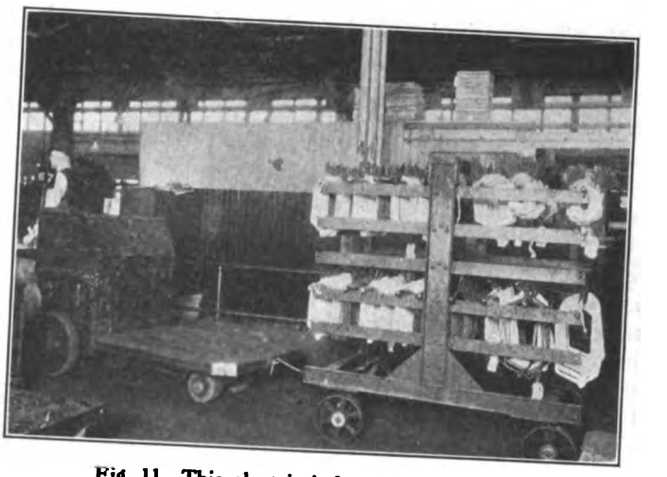


Fig. 11. This electric industrial truck is also used as a tractor, when necessary, to haul trailer loads of material.

ground floor, but also on the second floors of some buildings and even on the third and fourth floors of other buildings.

Overhead traveling cranes and jib cranes equipped with electric or air hoists are used extensively in this plant for the handling of materials because after certain units are partially assembled in process they become quite heavy. For inter-departmental handling it is necessary to use some form of truck or industrial railway, and the departmental cranes are used to load this equipment and also to unload parts to the floor. Fig. 3 shows the motor department stock of laminations and the method of unloading this material from the industrial cars which transports it from the stamping department. In Fig. 4, which is a general view of the small motors department, it will be noted that a number of types of equipment are properly coördinated. The overhead crane is used for short longitudinal movements of heavy materials and for the loading and unloading of industrial trucks while air hoists and electric hoists, mounted on jib cranes, assist the machine tool operators in the handling of parts to and from their machines. This photograph could be duplicated a number of times throughout the various departments at the East Pittsburgh Works.



Hand lift trucks and electric lift trucks are used for a number of handlings within departments. It has been found advisable when using skids to design them so that parts can be handled without damage while in transit. Fig. 5 shows how motor rotors and armatures are carried on lift truck skids. This is only one of the places where such methods of handling are used. It has been found advisable to have hand lift trucks located in all departments so as to make it possible for the workmen to move the skids on short hauls without the necessity of waiting for an electric lift truck (see Fig. 6).

When the idea of the proper handling of materials takes hold in any industrial plant, we find that not only production departments but also experimental, testing, and other non-productive departments immediately demand these mechanical aids for handling parts within their jurisdiction (see Fig. 7). By having large panels mounted on caster rack trucks, they are easily handled in the production departments and can be transported by the same method to the inspection department. It has been found that any mechanical device installed, regardless of the department, usually speeds up all handling operations and therefore materially increases the output of finished products.



Fig. 12. In the brass foundry this flask merry-go-round and overhead trolley system for handling hot metal materially reduces labor costs.

Fig. 13. View of the shipping department in the brass foundry. Note the all-metal tote boxes and industrial railway system.

The use of tractor trailer methods in this plant has not been fostered as the industrial railway takes care of all the long hauls which can be pulled into train lots. Occasionally, however, within departments it is necessary to make short hauls by means of four-wheel trucks, and for this reason most of the electric industrial trucks are equipped with an eye bolt hitch so they can take the place of a tractor for hauling of trailer loads. Such a load is shown in Fig. 11.

In going through the Westinghouse plant the writer

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was quite surprised to find the brass foundry located on the second floor of a building and was more surprised to find that the bringing of raw materials to the foundry and the taking away of finished products was accomplished by means of industrial railway trains.

The departmental handling in the brass foundry has been mechanicalized wherever possible and Fig. 12 shows the merry-go-round method of molding and pouring. The overhead trolley track equipped with a chain hoist is used for the handling of hot metal from electric furnaces to molds. There are several units similar to this in operation in this foundry. All sand is handled from the floor up into bins by means of bucket elevators and conveyors while the core oven is a continuous tray conveyor.

In a plant the size of the East Pittsburgh Works it is necessary to carry a considerable stock of rough castings, and the handling of these rough castings into and out of storage must necessarily be done as cheaply as possible. Fig. 14 shows how materials handling equipment keeps this handling cost at a minimum. This is only one of a number of storage locations between buildings and is taken near the electric locomotive department. Here we find the broad gauge railroad siding for bringing castings to the yard, and the narrow gauge industrial railway with the loading spur off the main track which can be served by the overhead traveling crane. In addition, along the right side of the yard, near the building, can be seen a concrete walk-way for electric industrial trucks. It will be noted in the group photographs that all means of transportation have been carefully considered in making layouts, so that any one of the four inter-departmental divisions can be used for handling materials.



Fig. 14. Outside storage departments are also fully equipped with mechanical handling methods. Note the concrete roadway for industrial trucks and the loading spur for the industrial railway.

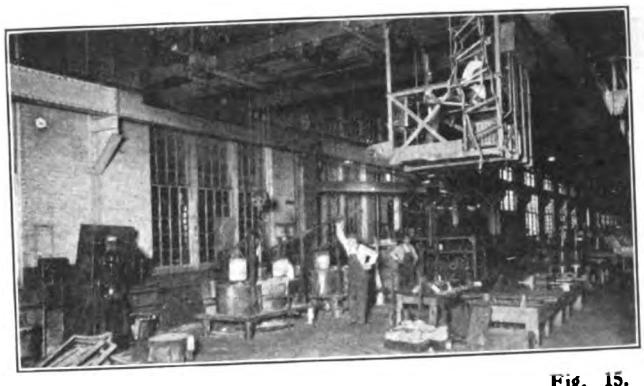


Fig. 15. In many production operations, cranes and hoists are used to assist the workmen.

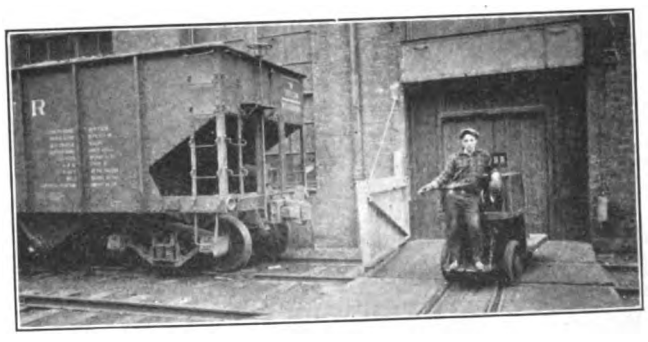


Fig. 16. Where industrial railways, electric industrial trucks, and standard gauge railroads cross each other it is necessary to provide safety gates.

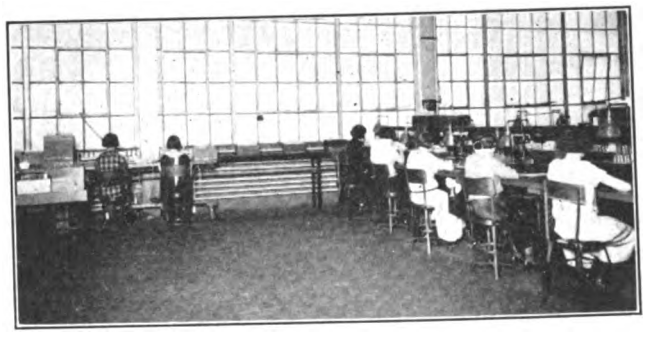


Fig. 17. Part view showing assembling and inspecting of radio tubes in process of manufacture. This department is being fully conveyorized.

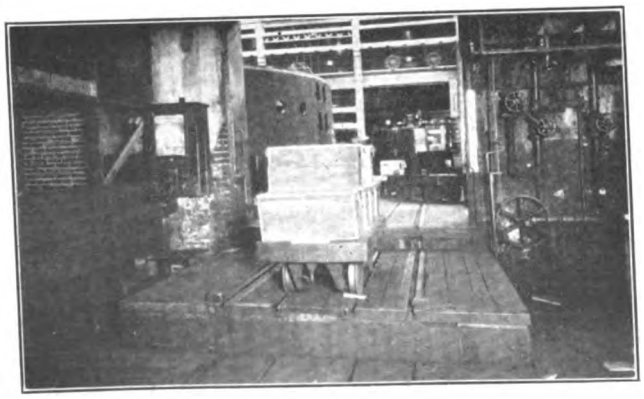


Fig. 18. This hydraulic elevator is used to overcome differences of floor levels without resorting to grades.

For the transportation of materials within the plant yard over eighty standard broad gauge railroad cars and seven steam locomotives are operated by the Interdepartmental Transportation Division. It requires from twenty-five to thirty men to man this equipment, which is under the immediate supervision of the yard master and an assistant yard master. The industrial railways and electric industrial trucks come under the supervision of a separate foreman and assistant foreman. To maintain this equipment and operate it requires approximately one hundred and fifty men. In and about the plant, there is from eight to ten miles of industrial railway trackage and over six hundred cars are required for this service. There are eleven storage battery electric locomotives used on the industrial railways, but only ten are assigned to regular routes, while one is held in reserve. These locomotives will haul from seven to twelve loaded cars and many more empties. As previously stated, the electric industrial trucks are controlled by the same department that oper-

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Fig. 19. General view of the classification shed for the industrial railway system.



Fig. 20. Scrap metal is loaded into the containers shown on the industrial railway cars at various departments throughout the plant so that it can be brought to this one central collecting station.

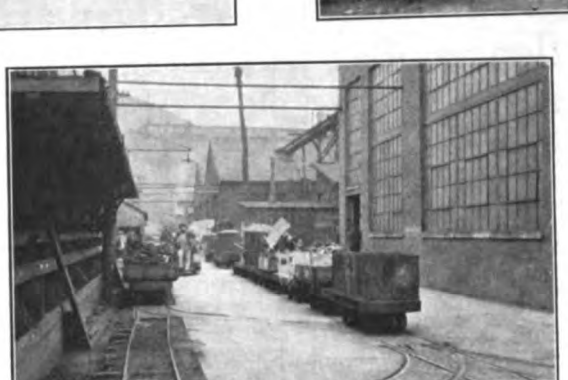


Fig. 21. It only took a moment to obtain this picture, but due to the heavy traffic at this point in the yard we find what appears to be a traffic congestion.

ates the industrial railway, and, at the present time, there are in operation approximately 85 trucks, half of which are the elevating platform type and the other half are the load carrying type. This combination permits flexibility and meets the need of both departmental and inter-departmental transportation. The lift truck type are generally used within the buildings for departmental transportation or from one department to another when the haul is not too long. The load carrying trucks are used on the long hauls between buildings.

In operating the industrial railway, definite lines of travel must be maintained where tracks are provided, and for this reason the load carrying electric industrial truck supplements this system of transportation and acts as a feeder both within departments and between departments. In operating the industrial railway, it has been found advisable to establish definite routes, each covering a specific territory and to have these routes covered on schedule by certain equipment and crews. With this method, loaded cars are classified according to destination, and trains are made up in what is known as the classification shed (see Fig. 19). This shed consists of a number of parallel spur tracks, each of which is reserved for the accumulation of cars consigned to its particular territory. This is really a terminal or clearing house for all routes and is the centralization point for all equipment not loaded. Industrial railway routes are each covered from six to eight times a day and whenever possible everything is handled on the long haul by this division.

To give some idea of the amount of transportation in the plant yard at East Pittsburgh, we call the reader's attention to Fig. 21. This is one of the strategic points in the transportation system for both electric industrial trucks and the industrial railway. It required only a moment for the photographer to set up his camera but as trucks and trains were coming from every direction, this photograph gives the appearance of a real traffic congestion. It required, however, only a moment to have things moving again and this photograph serves its purpose by showing the miscellaneous class of merchandise, etc., which must be handled between departments in this plant.

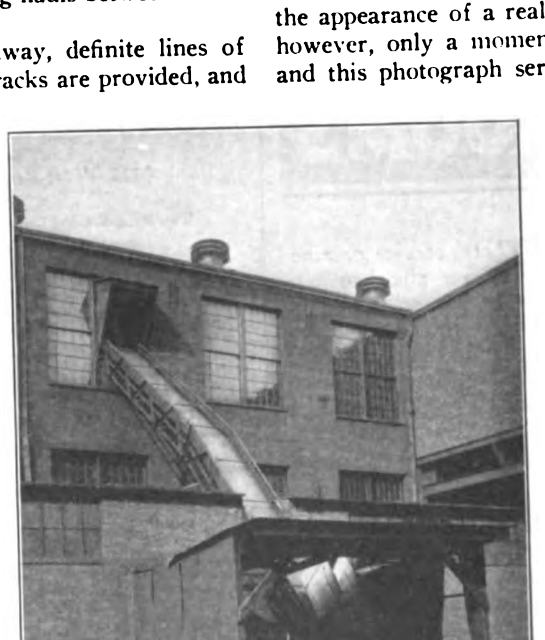
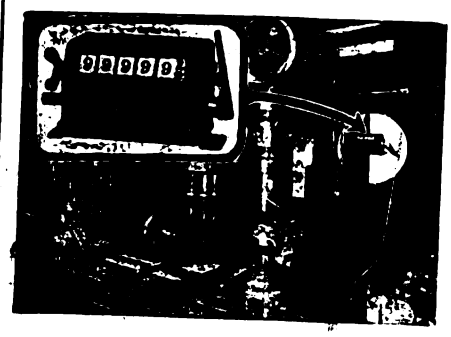


Fig. 22. This push bar conveyor elevator lifts boxes from ground level to second floor of the shipping department.

One of the most recent departments put in operation at East Pittsburgh is for the manufacture of radio tubes. This department is laid out in direct or straight lines of travel so that raw materials are fed in at one end of each table, and as progressive operations on the tubes take place, the containers holding them are moved along to the next operation. At the far end of the table they are placed on a belt conveyor, which brings all the work to the two inspectors, shown at the left in Fig. 17. Here another slight operation is also performed and the work proceeds to the next step by means of the same conveyor. It would be difficult to fully describe this department, but when conveyors were not in use there was a great deal of confusion and damage to work

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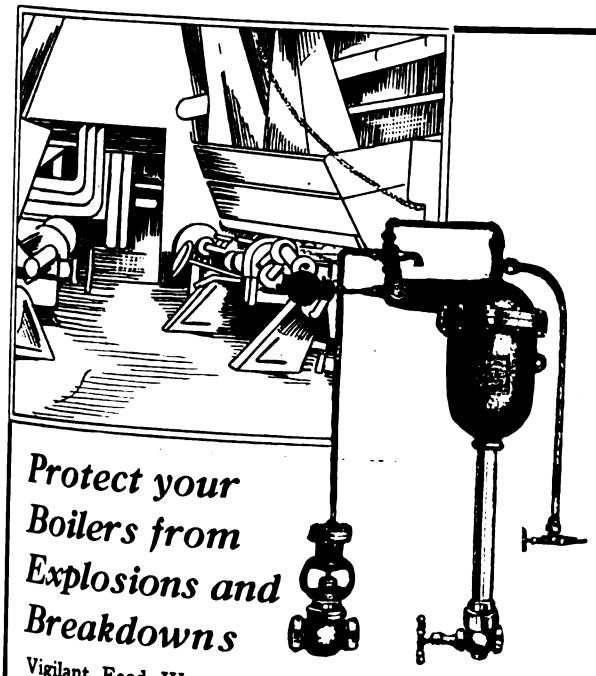
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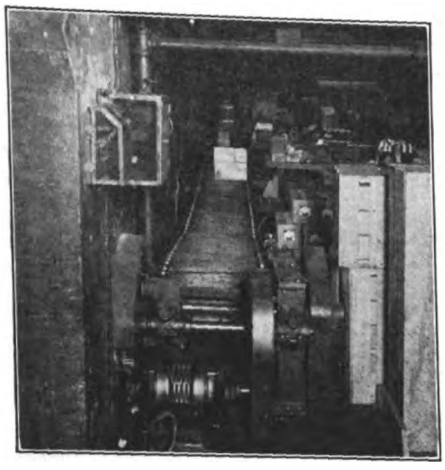


Fig. 23. It was difficult to obtain a good picture of the gravity conveyors and platform conveyors used in the shipping department due to low headroom and length of room. This is the best one we could obtain.

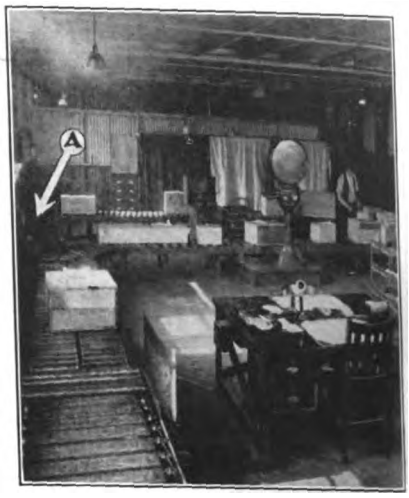


Fig. 24. Discharge end of slat conveyor which passes through shipping room. Note the location of equipment to facilitate checking and rapid handling.

in process. The installation of conveyors has materially increased production, reduced the amount of floor space required for the department and saved many dollars in loss due to damage in handling and in transit.

With the number of diverse products mentioned in the second paragraph in this article, and many others which were not mentioned, the Westinghouse Electric & Manufacturing Company have a difficult problem of shipping. Many of the larger units of transformers, generators, turbines, etc., are shipped direct from their respective departments after assembly; but smaller units, such as motors, transformers, relays, controllers and other miscellaneous products of small size are brought to one central shipping department, where they are packed, crated, billed and loaded in freight cars.

In the centralized shipping department, continuous conveyors of the power driven and gravity roller types are used for the transportation of material. Hundreds of boxes pass over this system each day. The boxes themselves are made in a separate department and are brought to the shipping department by electric industrial trucks or the industrial railway and are loaded direct to the push bar chain conveyor, shown in Fig. 22. This conveyor raises the boxes from the second floor of the building, where the majority of small parts are packed for shipment.

In this building a number of men are continually packing and to make their work as efficient as possible they are provided with short runs of gravity conveyor upon which to pack the boxes which are then transferred direct to a platform slat conveyor, which runs the full length of the shipping department; a distance of approximately 150 feet. The discharge end of this platform slat conveyor, the checking and weighing equipment, also the variety of boxes handled in this department, are clearly shown in Fig. 24. On this short run of gravity conveyor everything is marked, checked, and then discharged direct to a gravity spiral chute, which lowers the boxes to the first floor on the shipping platform. The feed end of the spiral chute can be seen at point "A," Fig. 24, while the chute itself and discharge run of gravity conveyor on the first floor is shown in Fig. 25.

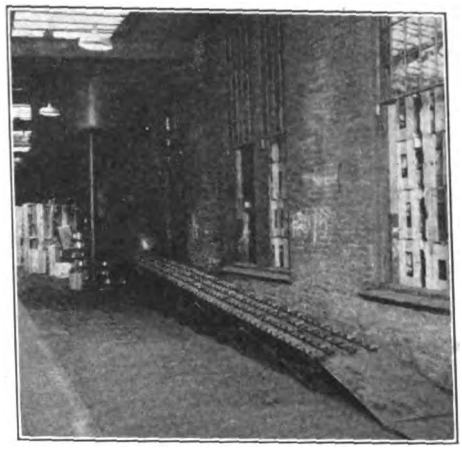


Fig. 25. For lowering packages from the second floor of the shipping department to the first floor for car loading, a gravity spiral chute is used.

In packing small motors, transformers and other equipment, which are crated and shipped in single unit

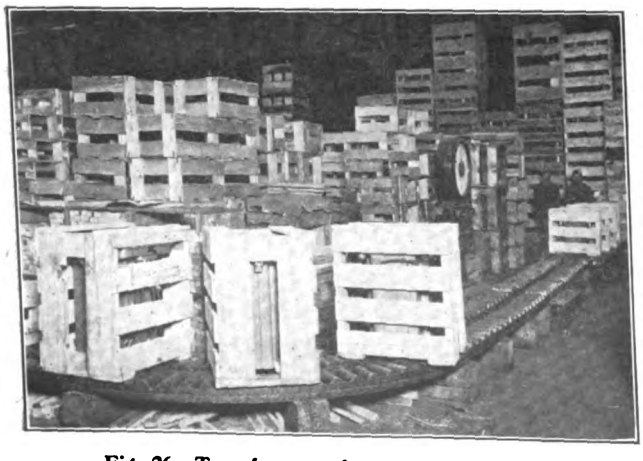
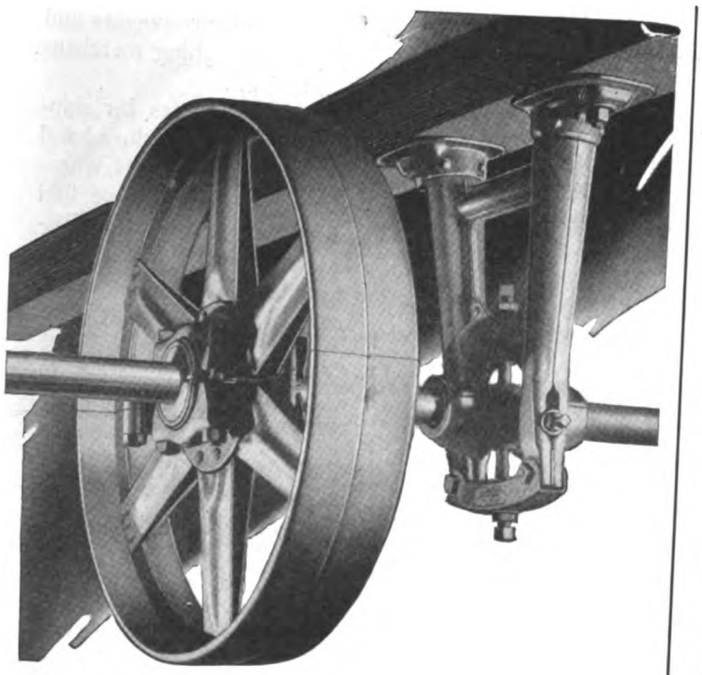


Fig. 26. Transformers, large motors, and other heavy equipment are crated on the first floor of the shipping department.



Fig. 27. Wherever possible, progressive crating and weighing on gravity conveyors is employed, as shown here.

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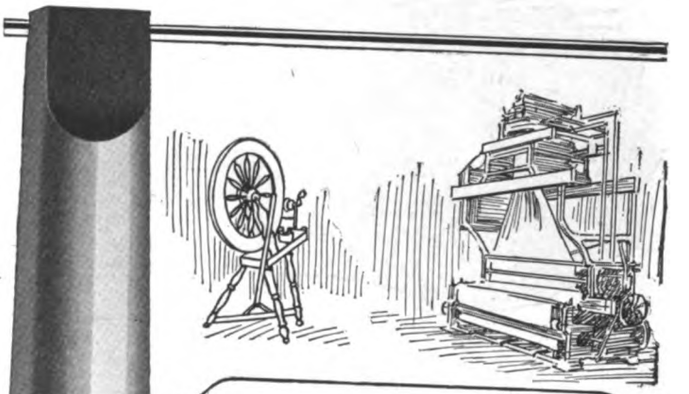
Readers of American Pulley Company advertising are referred to MacRae's Blue Book for the name, address and telephone number of the nearest dealer.

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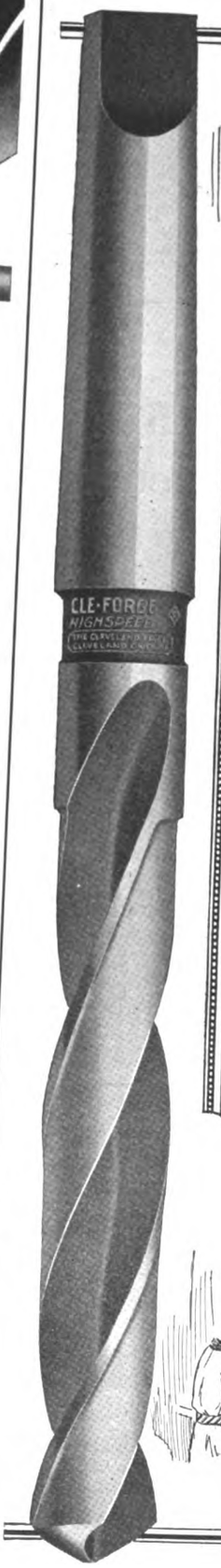
THE demand for more thread doomed the spinning wheel; for better holes, the primitive bow drill; for more speed, the sharpened bit of bone which served for a drill. In another generation, today's great looms and drill presses and high speed drills may be under glass in museums.

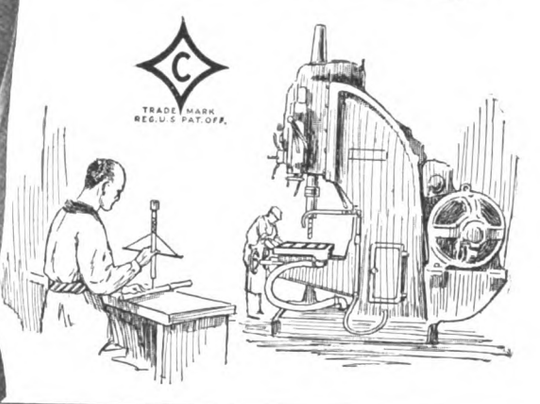
But, with all the progress in machinery and methods, *Cle-Forge High Speed Drills*, with their world's records for drilling through cast iron, machinery steel and armor plate, possess an ample reserve of drilling ability over today's requirements.

And when the time comes that you shall require more than this superlative expression in drilling tools, you will find that the same organization which produced *Cle-Forge* will have it ready for you.

Remember, meanwhile, that *Cle-Forge* is the drill that "tells its own story" best. It is carried in regular stock at all times by Cleveland dealers everywhere.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON





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SKYCO NoGlare

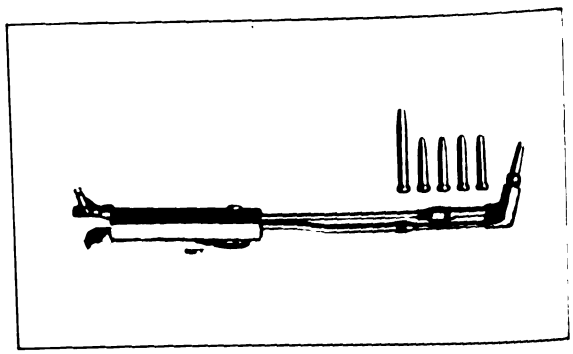
lots, the operation is performed on the first floor of the shipping department. Here gravity roller conveyors and a progressive method of crating and weighing merchandise is used as shown in Fig. 26 and 27.

In the handling from conveyors to the cars for shipment, both electric industrial trucks and stevedore hand trucks are used. In other shipping departments where heavy crates or large machinery are handled, we find overhead cranes used for car loading. It would be difficult to segregate the cars loaded at each department, but as a total there are approximately 1,500 finished carloads of products shipped from East Pittsburgh every month.

In passing through the plant one is immediately impressed with the mechanicalization of all handling and is constantly reminded of the fact that aisle-ways are maintained primarily for the transportation of material. In conversation with various department heads, the writer was made to realize that transportation and handling at this plant was not a hit-and-miss proposition but the subject was being given serious consideration from the Works Manager down. The fact that such a large company has in operation so many of the various types of materials handling equipment now manufactured should be sufficient proof that this class of equipment is necessary for economical operation.

Low Pressure Combination Cutting and Welding Torch

THE Alexander Milburn Company, of Baltimore, Md., has just produced a low pressure torch which will operate on either low pressure or high pressure gas. It is especially constructed to operate with low pressure acetylene gas, city gas or hydrogen. It can also be used with a low pressure acetylene generator.



This torch is adapted to perform welding as well as cutting work by the interchange of tips.

The tips are made of solid copper and are interchangeable with a large number of low pressure torches of other makes.

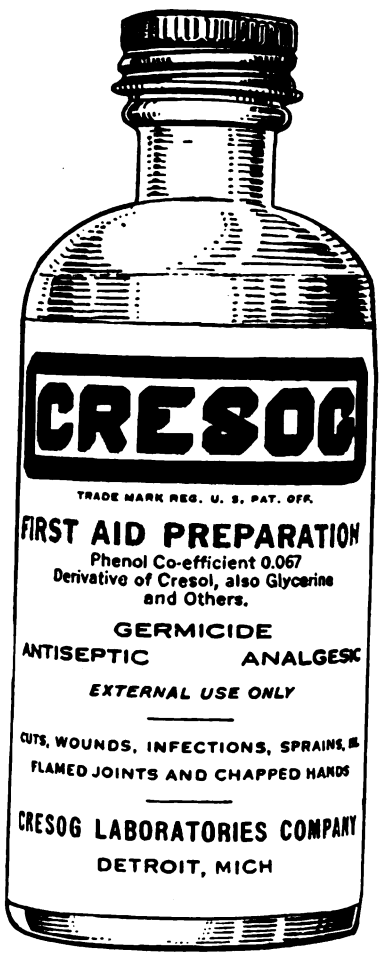
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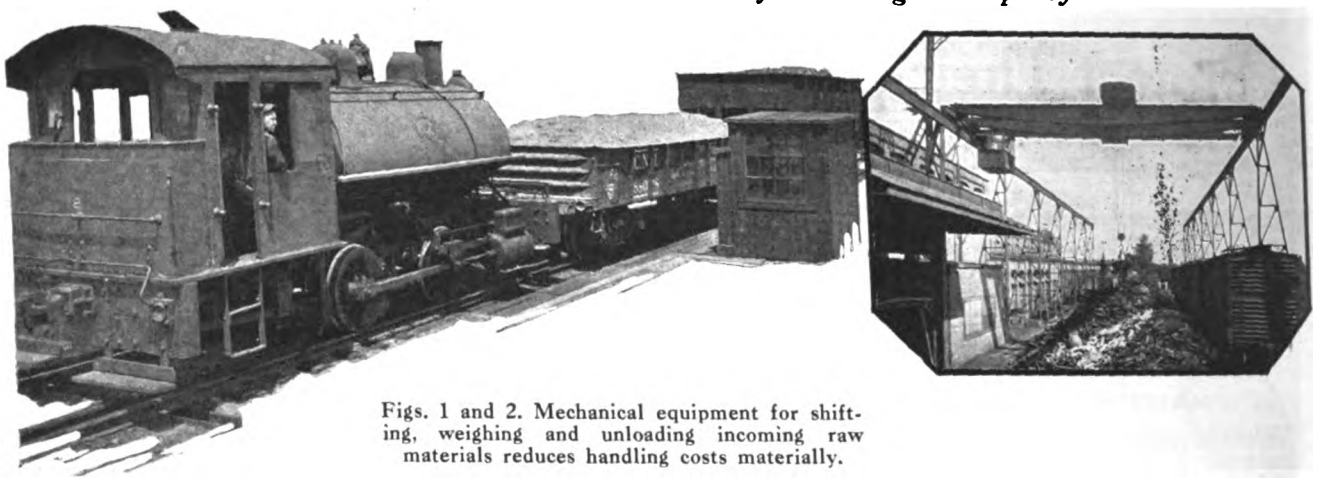
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Where Handling Methods Keep Pace with Expansion

The Chapman Valve Manufacturing Company



Figs. 1 and 2. Mechanical equipment for shifting, weighing and unloading incoming raw materials reduces handling costs materially.

THE Chapman Valve Manufacturing Company, located at Indian Orchard, presents an ideal study of materials handling methods and their application to transportation and handling of semi-standard products. By semi-standard products we mean those that are similar in design and construction but different in detail. For instance, this plant manufactures only straightway gate valves, but they range from ¼" brass valves to cast iron valves as large as 108", and also a number of various size steel valves. In addition, practically all valves can be made to change their type by the addition or subtraction of one or two parts.

The two original buildings of this company were erected on the present site in 1874. A small single-story building was used as the foundry, where brass and iron were cast and contained a total floor area of 7,650 square feet. The machine shop was a three-story brick structure with a floor area of 10,900 square feet. The original factory has grown until now there are three separate foundries for brass, iron and steel. These with the machine shops, power house, etc., comprise a total floor area of 365,425 square feet.

The reason for giving this brief history is to show the reader that this plant is not a new structure built for a particular purpose but is the natural growth of a manufacturing concern located in one place for a number of years. Many executives when considering the installation of materials handling equipment use the argument that if they were building a new plant they would install all the modern improvements, but their present buildings will not permit them taking advantage of the savings which could be effected by using such devices. The real executive is the one who will apply modern methods and equipment to the best advantage under existing circumstances.

To describe the methods employed in this plant we will start with the receipt of incoming materials. Due to the nature of the plant and its physical layout, it is necessary to spot cars at various doorways for loading and unloading. All freight is received on a spur track from the main railroad and is moved about the plant yard by a small yard locomotive that is shown in Fig. 1. By operating their own locomotive the company's traffic department is able to shift cars whenever and wherever desired.

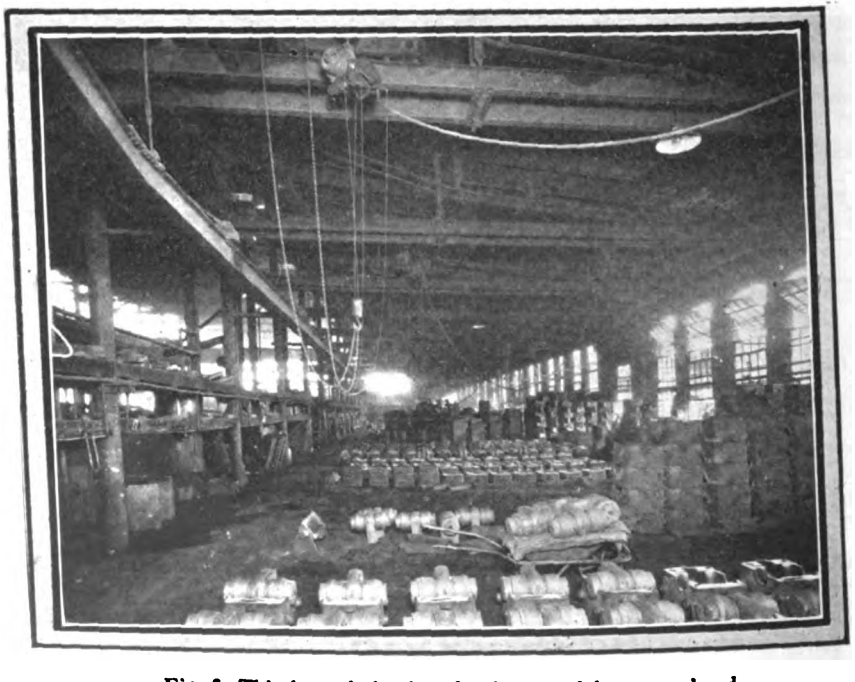
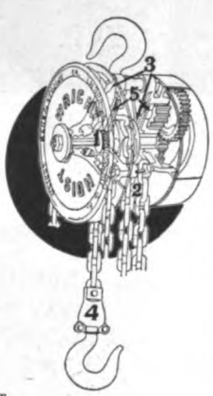


Fig. 3. This bay of the foundry is served by many hand operated transfer cranes equipped with a number of air hoists.

It is being found by a number of industrial plants that serious leaks and losses can be detected if all incoming materials are weighed prior to unloading. For this reason, the Chapman Valve Manufacturing Company have installed a track scale

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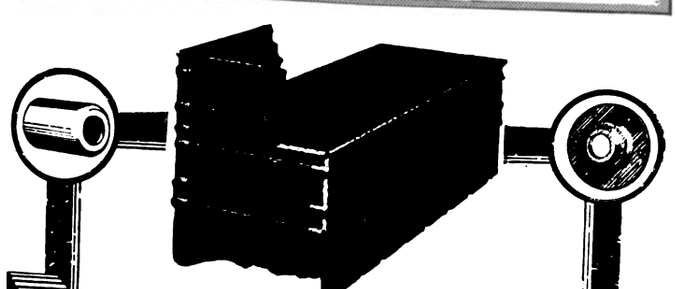
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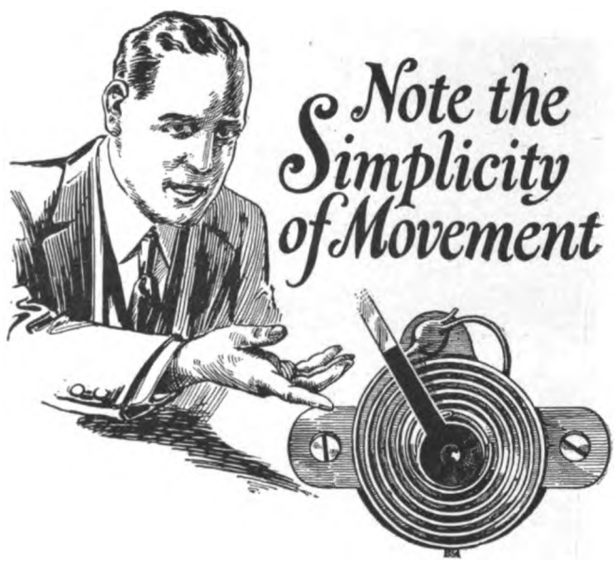
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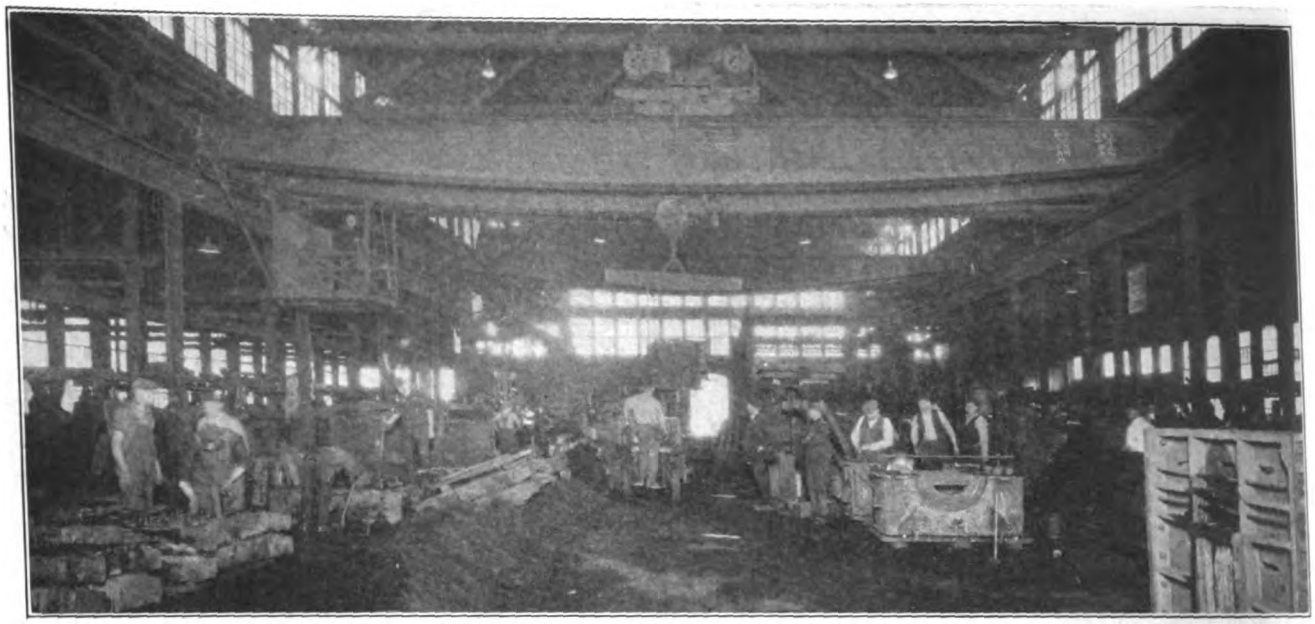


Fig. 4. The foundries are well equipped with various types of materials handling equipment. Note the overhead crane loading the electric lift truck.

for check-weighing against the bills of lading. The beam house of this scale can be seen to the right of Fig. 1.

The unloading of pig iron to the extent of 150 cars, or 6,861 tons per year, does not seem to present a serious handling problem, but when we consider that this same material has to be re-handled to the cupola charging floor the advantages of using some mechanical means of transportation and lifting becomes apparent. Fig. 2 shows the overhead traveling crane, equipped with an electric magnet, which is used for the unloading, lifting and transporting of pig and scrap iron, both from cars to stock pile and from stock pile to the cupola charging platform, shown to the left. A bar of pig iron is a good load for one man to lift but the crane and electric magnet can lift fifteen or eighteen bars with ease.

While the sand storage in this plant is not as convenient as might be installed in new plants, the company has found it advantageous to use portable belt conveyors similar to that shown in Fig. 3 for the handling of sand. When unloading sand, the conveyor is placed with one end at the car door and the other end inside the building. The use of such conveyors has greatly reduced the cost of handling sand. We direct the reader's attention to the special tarpaulin placed over these conveyors when not in use. It has been found in actual practice that a longer life and more satisfactory operation of such equipment can be obtained by proper protection.



Fig. 5. This illustrates the method of charging the electric furnace with a monorail telpher.



Fig. 6. Protective covering for portable equipment that remains in the open has been found advisable.

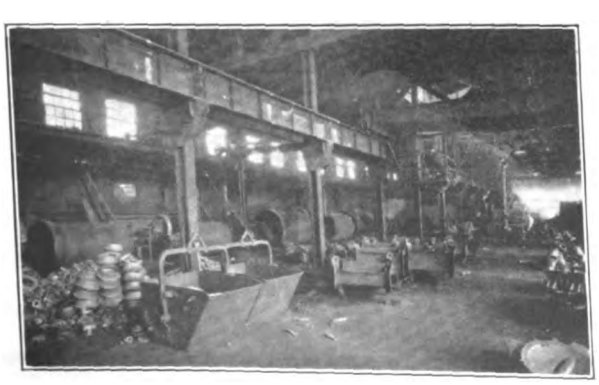


Fig. 7. Overhead traveling cranes handle castings to and from the tumbling barrels.

A considerable portion of this plant is devoted to the three foundries, general views of which are shown in Figs. 4, 8, and 12. In these foundries all transporting and lifting of materials is done by means of some mechanical device. The main bay of the iron foundry (Fig. 4) is equipped with two large 20-ton cranes, both used for the handling of flasks, cores and hot iron. In the side bays (Fig. 2) hand operated transfer cranes equipped with air hoists are used for the same operations. A main aisle is maintained through the center of the foundry to permit the passage of electric lift trucks, which are used for handling parts from the foundry to other buildings. In

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Pressed from a circle of cold rolled steel—cannot crack, break or leak. Good for many years of service. Actually, some have been 20 years in use.

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A. J. Tilton, Assistant Production Manager of Bassick Manufacturing Company, says:

"IN three years' time the McCaskey System has saved us more than $10,000 in tool breakage and production time, and *as much again* in tool crib labor.

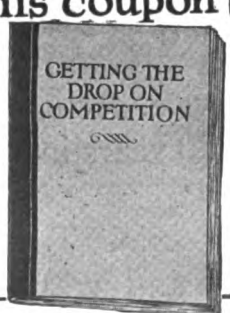
"During that time our production has increased 150% and our tool crib expense is only 65% as great.

"Six months after we installed our first McCaskey unit it had saved us $1,000 in breakage alone. These savings have been greatly increased in the three years since then. This unit now keeps perpetual inventory on 1,000 gauges, taps and drills as well as 5,000 Alemite Zerk Blue-prints.

"So successful was the first unit that we installed a second to handle our 1,000 screw machine layout. We have been able to reduce our tool crib force from 7 to 4 men, and cut down the salaries of 10 men from the Production Department. Credit goes to the McCaskey System for at least half this saving."

Reports of this kind are not unusual from McCaskey users. Similar savings can be easily accomplished in your business. Send today for your copy of our FREE BOOKLET—"Getting the Drop on Competition." There's no obligation attached to your request.

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the knockout section of this foundry, an overhead traveling crane handles the castings, and this same crane also handles them to the tumbling barrels (see Fig. 7).

In the steel foundry (Fig. 8) two overhead traveling cranes are used for transporting and lifting materials. In the foreground can be seen skips which are used with the cranes for handling small castings from the knockout section to the cleaning section. For loading the tumbling barrels, one crane is generally equipped with an electric magnet for lifting the castings. The steel foundry is also well equipped with hand transfer cranes and jib cranes, from which are suspended electric and air hoists to assist the core makers and molders on particular operations. The charging of the electric furnace in this foundry is also done mechanically by an overhead monorail telpher system. Fig. 5 shows the monorail telpher charging the electric furnace. In the background, to the right, can be seen the scrap steel storage for this furnace. Over this storage area the monorail telpher runs onto an electric transfer crane so as to move at right angles to the charging track. For loading the charging buckets an electric magnet is used.

With this method of handling, the furnace can be fully charged in a few minutes.

In the brass foundry (Fig. 12) we again find overhead transportation used for the handling of hot metal, but here only a single monorail track and trolley system is used. In the brass foundry we also find chain hoists and electric hoists used for lifting various parts and castings. For the handling of sand and scrap metal the wheelbarrow is used for transportation due to the impossibility of allowing large aisle space.

For the handling of refuse from the cupolas, foundry and other parts of the plant, four horses and four small wagons were formerly employed. These horses with their drivers used to be kept busy all day hauling this class of material, although the distance to the dump was only a few hundred feet. As the necessity of dumping the loads further away from the plant presented itself, mechanical means for transporting this material were investigated and the equipment shown in Fig. 10 is now employed. There are two of these gasoline tractors and four trailers used for hauling this material. Now the work is done faster than with horses, although the hauling distance is approximately three times as great. This is accomplished by speedier



Fig. 8. General view in the steel foundry showing overhead traveling cranes which handle practically all materials.



Fig. 9. Method of taking crucibles of metal from retort in brass foundry.

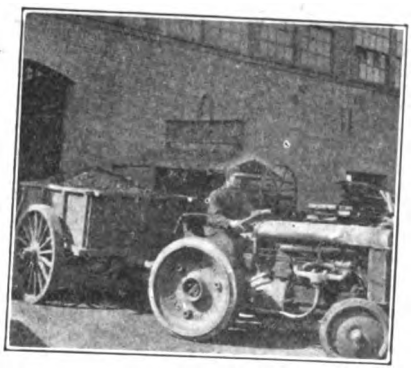


Fig. 10. Foundry refuse is handled by gasoline tractors and wagons.



Fig. 11. Steel castings are brought to and taken from this storage yard by electric lift trucks.

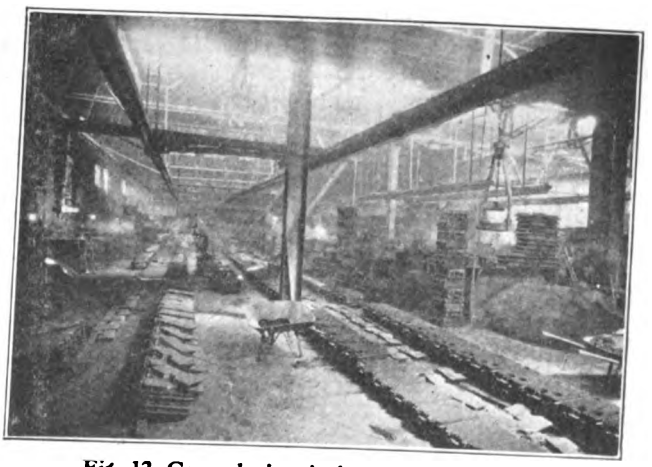


Fig. 12. General view in brass foundry showing the placing of small molds, also overhead trolley system for handling hot metal.

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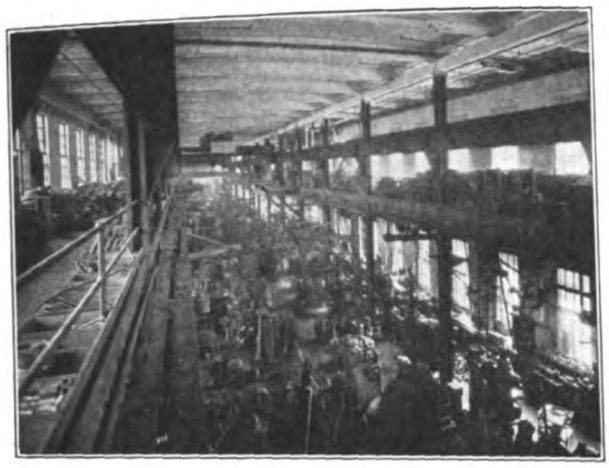


Fig. 13. Department 10 is fully equipped for handling all valves larger than 12" diameter.



Fig. 14. General view in machine shop department 39 showing how short shifts of materials are made with hand lift trucks.

operation and the hauling of larger loads.

For inter-departmental transportation three electric lift trucks are operated on a definite schedule and this method of truck operation has been found best suited to plant conditions. In addition to the three trucks operating on schedule, there is one truck operating on special loads and to fill in for emergencies; and one truck held in reserve. To make transportation from one building to another as safe as possible, concrete runways have been provided for the industrial trucks; and in all manufacturing departments wide aisles properly marked have been laid out and are maintained so as to avoid delays.

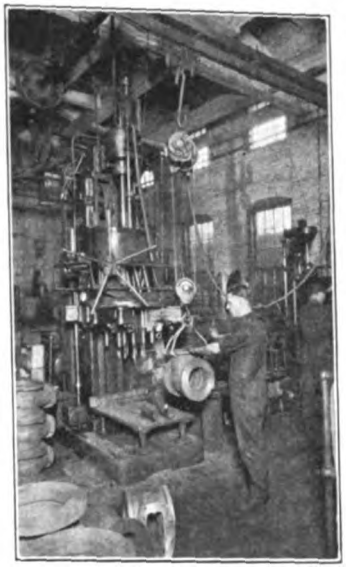


Fig. 15. In this plant, machine tool operators are relieved of all heavy lifting by the installation of electric and air hoists.

When transporting rough castings to the machine departments the electric truck brings the load as close as possible to the point required. Due to the location of the machinery which makes it difficult for the electric truck to operate closer, it has been found best to have a number of hand lift trucks in these departments for making short shifts of both rough castings and finished castings loaded on skids. A general view in department 39, where the medium-sized rough castings are machined, is shown in Fig. 14.

In all manufacturing departments in this plant, a ruling has been made that wherever possible the lifting of castings by hand should be limited to a certain definite weight. In this way many accidents have been eliminated and the amount of time off for strains has been materially reduced. It has also been found that by using air hoists and electric hoists wherever possible for the placing of castings into machine tools the production of these machines has been increased.

As previously stated, this company manufactures valves down to ¼" in size. These smaller valves are machined in department 17 on the second floor of the building above department 39. Here most of the materials are handled in caster box trucks or tote boxes placed on skids for transportation by means of hand lift trucks. In order to eliminate and check loss between operations, parts are frequently counted, and to simplify this counting the work is done by means of a counting scale, as shown in Fig. 20. Similar scales are also used in the parts stock-



16. By properly installing the overhead trolley track, one hoist can be made to serve two machines.



Fig. 17. Due to the heavy loads all hand lift trucks are equipped with large diameter wheels.

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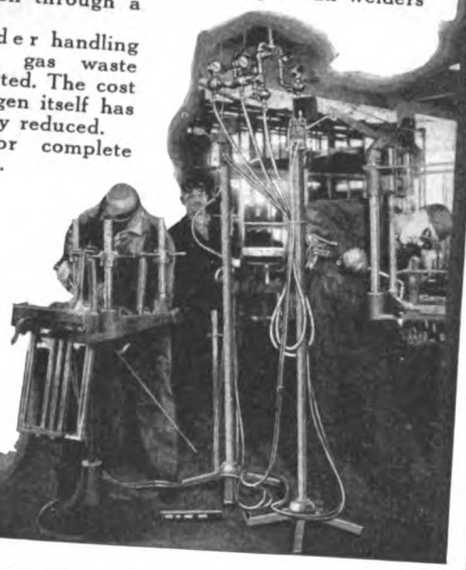
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Fig. 630

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1/8 h. p. Cast iron frame. Enamel finish. Plain bearings, grease cups. Operates on A. C. or D. C.



No. 3GM—Stripped

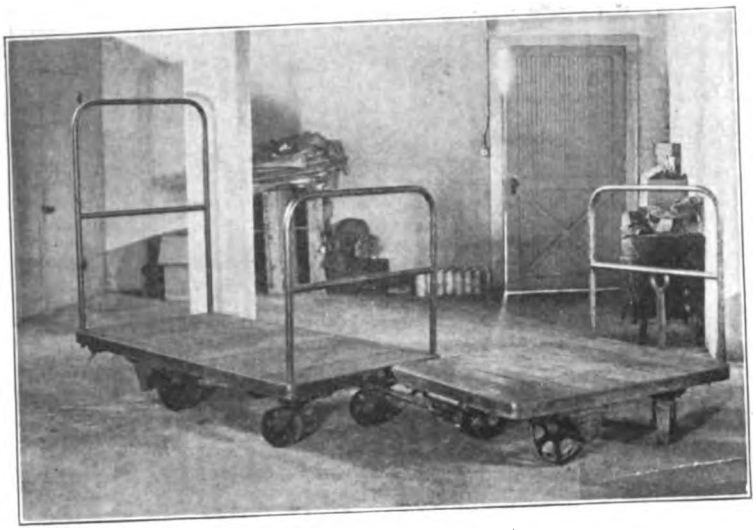
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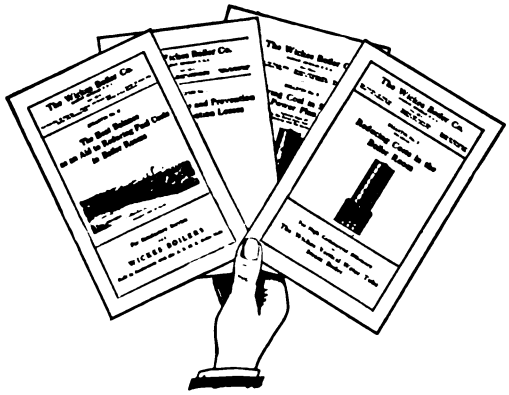
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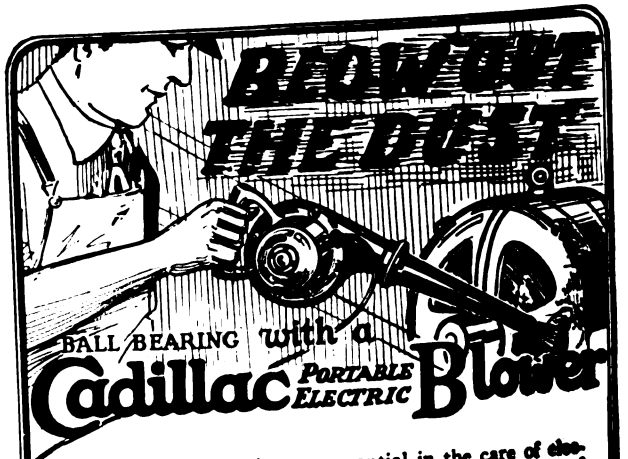
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Fig. 18. In department 17, where small brass valves are made, considerable handling is done in tote boxes.



Fig. 19. Wherever electric storage battery industrial trucks are used it is necessary to have battery charging equipment.

room for counting out and counting in various parts for requisition and from process.

The shipping of completed valves is done at two points in the plant. Valves larger than 12" diameter are manufactured in department 10, where they are also assembled, tested and shipped (Fig. 13). Small valves, ranging from ¼" up to 12", are generally brought to the materials stores department unassembled, from which they are requisitioned to order. From this department the parts are transported by hand lift trucks, or electric lift trucks, to the assembling and testing floor.



Fig. 20. Weighing and counting of material in process is a handling operation which can frequently be simplified by using a counting scale.

If it is necessary to hold valves awaiting shipment, they are placed in a separate storage building, as shown in Fig. 21. Certain valves are carried assembled in stock and are also stored in this building. It is interesting to note that by using three transfer cranes equipped with one electric hoist, this entire storage area is served. When valves are requisitioned from this stockroom, they are either loaded direct to cars or to motor trucks for shipment.

At the Chapman Valve Manufacturing Company the handling of materials between departments has been centralized under one man known as the Materials Supervisor. His department is responsible for all material placed in stock and the transportation of materials between departments. At the present time the equipment directly under this department's jurisdiction consists mainly of the electric storage battery trucks also a few hand trucks and skids, but no doubt as time goes on its activities will increase until it will have a direct control of the use of certain materials handling equipment within departments.

The value of handling all materials mechanically has been realized by this company, and the activity expressed by the use of the present equipment, and the open-mindedness of the management indicates that even more progressive steps will be taken in the application of this class of equipment.

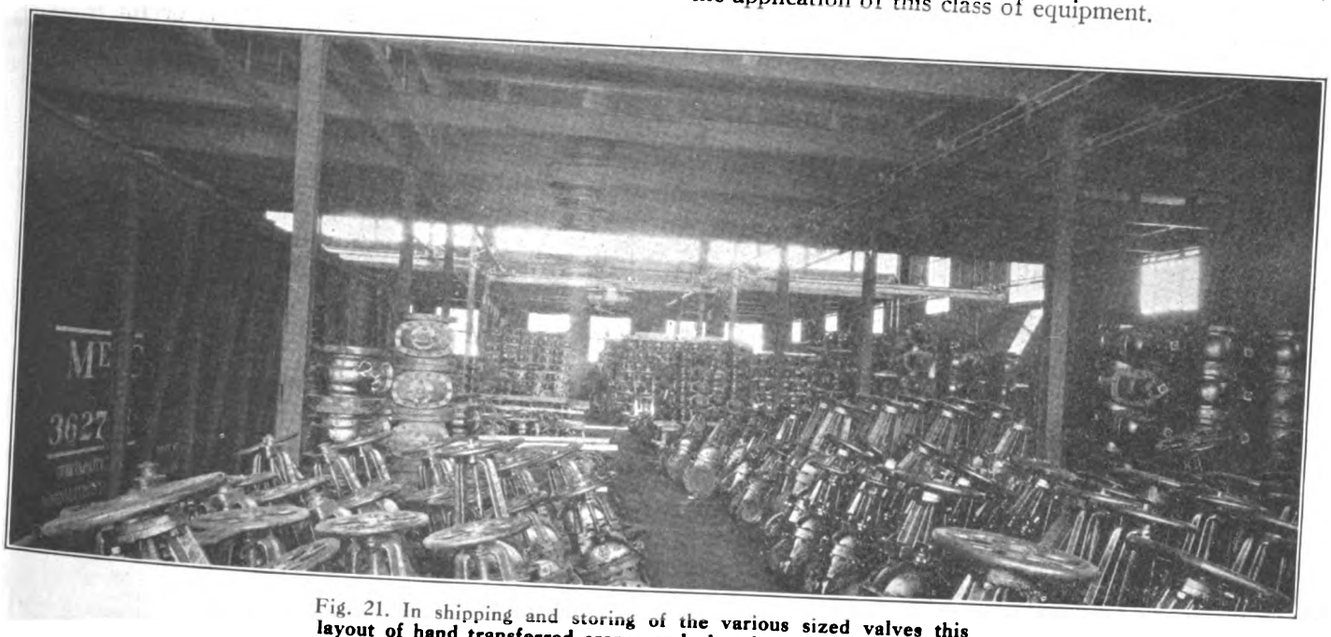


Fig. 21. In shipping and storing of the various sized valves this layout of hand transferred cranes and electric hoists simplifies the handling.

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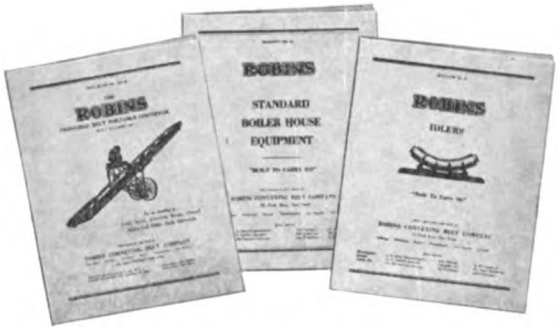
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Modern Handling of Coal and Ashes

Even the Small Plant Profits by Mechanical Methods

THERE is no doubt that every industrial executive realizes the necessity of using some form of mechanical equipment for the handling of coal and ashes. Practically every type of materials handling equipment has been installed for this purpose, and it is now agreed that regardless of the type of plant or the physical layout of the equipment some mechanical means can be provided for handling the two most important materials in power plants, namely coal and ashes. Engineers agree that the layout of power equipment has a direct bearing on the type of materials handling equipment that can be installed, and, for this reason, it is difficult to specify arbitrarily that any one type is best adapted for any given size of power plant.

Without fear of contradiction it may be said that in the handling of coal and ashes more development and educational work has been done by the materials handling manufacturers than in any other handling operations known to industry. This is a natural trend for the reason that these two materials lend themselves to various methods of handling due to the volume handled in practically every industry. Even the smaller boiler houses use from ten to twenty tons of coal per day, while some of the larger ones will consume from one hundred to two hundred tons of coal per day. Practically every industrial plant has a power house either for generating electric current process steam, or for heating the plant. Thus the number of prospects that could use mechanical equipment for handling these materials represented the largest available

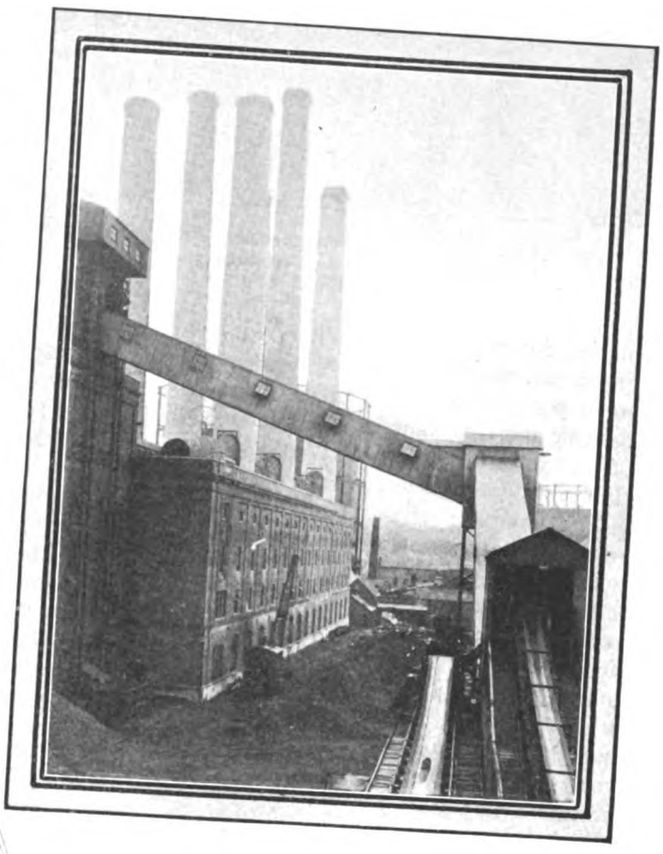


Fig. 1. At the central power stations various types of materials handling equipment cut handling costs.

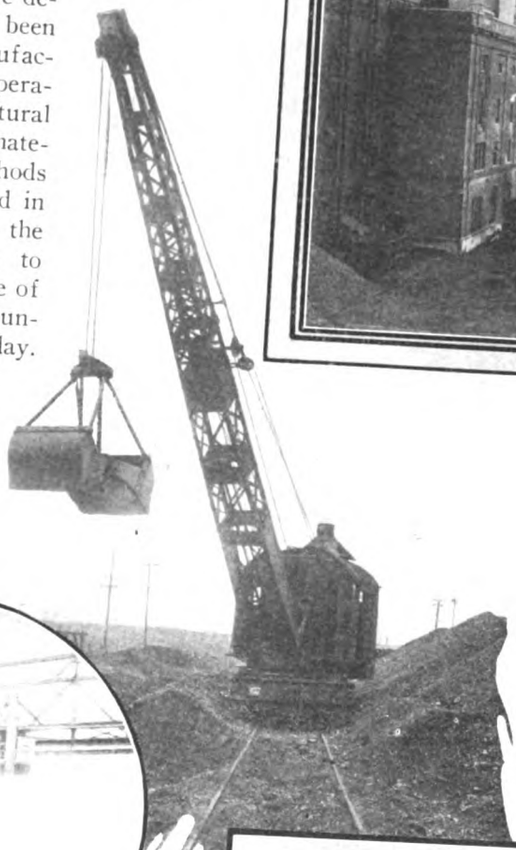


Fig. 2. Steam driven locomotive cranes traveling on tracks are extensively used for handling coal and ashes.



Fig. 3. Car dumper discharging to auxiliary or gantry crane feeding pit.



Fig. 4. General view of the equipment shown in Fig. 5. The car dumper is a portable unit.

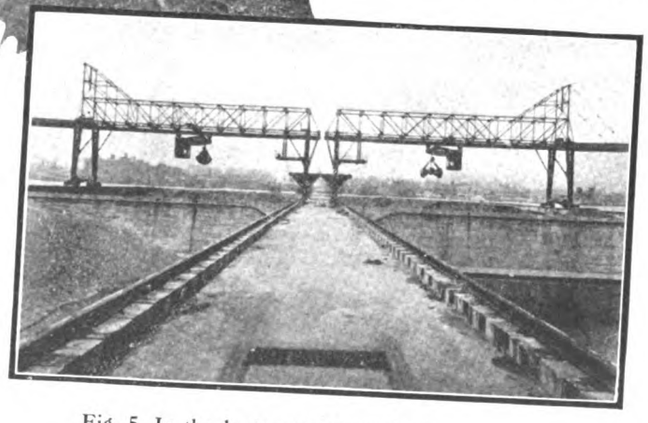


Fig. 5. In the large storage yards gantry cranes can serve a wide area.

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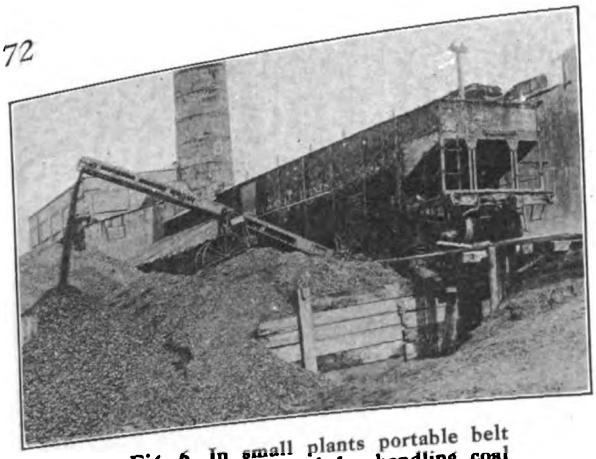


Fig. 6. In small plants portable belt conveyors are used for handling coal and ashes.



Fig. 7. In most plants a capstan winch should be installed for moving cars.

market for mechanical handling equipment. The photographs shown, from Fig. 1 to Fig. 25, cover only a small portion of the installations made throughout the country and they show equipment from the simplest type of portable belt conveyor (see Fig. 6) up to the more elaborate type of gantry crane shown in Fig. 25.

The handling of coal starts at the time when it is removed from its native state in the mine and continues until it is finally discarded in the form of ashes. There is no doubt that this product (coal) passes over more types of materials handling equipment than any other product used or made by industry. What has been done in this field should also be done with every other product which requires handling, and by studying the different installations that have been made for the handling of coal and ashes within various types of power plants, engineers and executives will find that some of the most difficult engineering problems have been met and solved, and that some of the problems which now confront them in connection with other handling operations are indeed simple.

Let us consider just the illustrations shown in this article, and take into consideration the factors involved in handling the two materials in question, namely coal and ashes. We find that coal has lubricating properties, comes in various sizes from pea coal to large lumps, and contains a corroding agent in the form of sulphur. Ashes are generally damp, very abrasive and also contain a corroding agent. In addition, we find that no two boiler houses are designed and operated exactly alike, and the quantity to be handled per day will range from ten to 100,000 tons, and yet all conditions have been met, and installations of various types of materials handling equipment have been extensively made, and are successfully operating.

Industrial and economic conditions demand that all power plants carry a large reserve coal storage pile adjacent to the plant as a protection against mine shut-downs, strikes, car shortage, etc. This requires a double handling of coal after it is received on the plant siding, and also makes a problem in providing the proper storage yard facilities. In the small plant the coal is generally piled by portable conveyors (Fig. 8) or some form

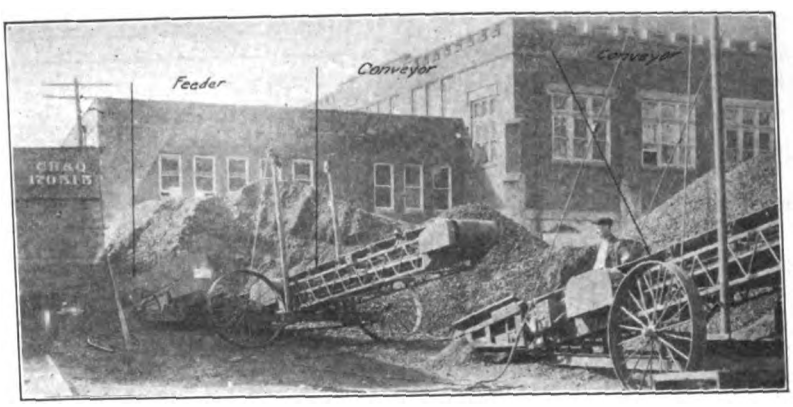


Fig. 8. Portable conveyors can be made to serve a wide storage area.

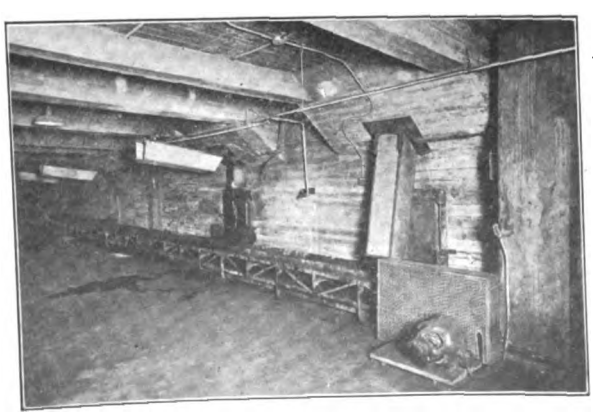


Fig. 9. Overlapping pan conveyors provide a good method for handling ashes.

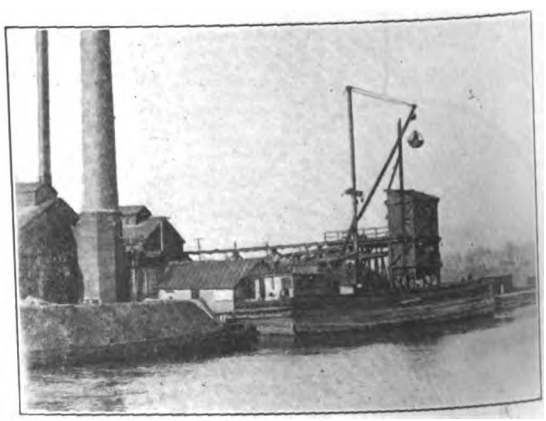


Fig. 10. Plants located on rivers or canals have found the mast and boom for feeding automatic car trestles an economical type of equipment for h ndling coal.

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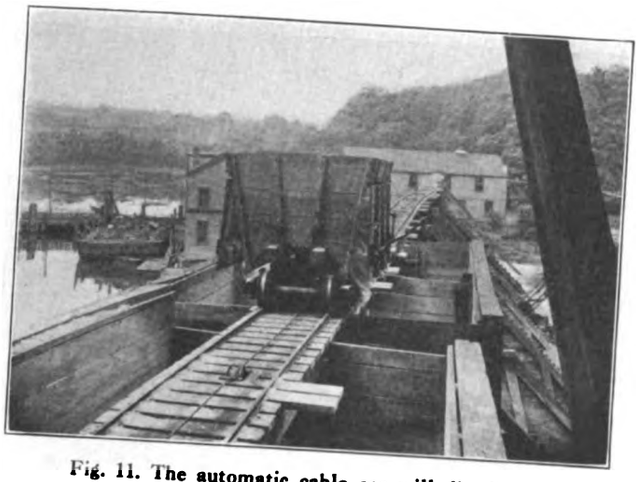


Fig. 11. The automatic cable car will distribute coal quickly and economically.

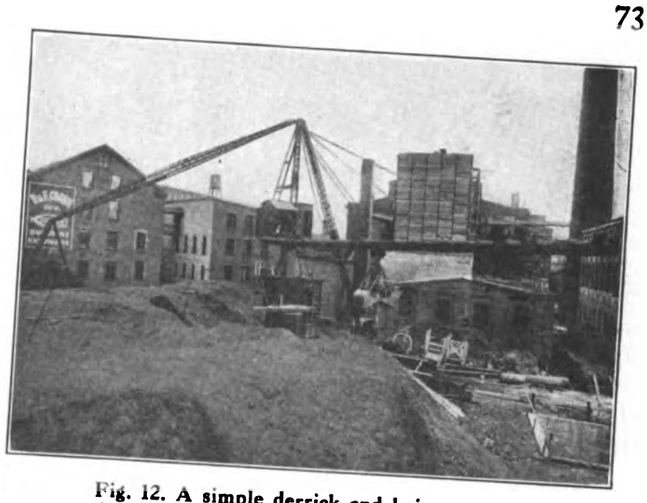


Fig. 12. A simple derrick and hoist properly designed can be installed in the plant yard for handling both coal and ashes.

of locomotive crane (Figs. 2 and 19), and this same equipment is used for reclaiming the coal when it is to be fed to the bunkers or boilers.

In larger plants different conditions exist, and we find the factor of capacity consumption playing an important part in the type of equipment to be used for handling. For instance, in Fig. 23 we see a rotating car dumper which will discharge a full car load full of coal direct to the conveying system which feeds the overhead bunkers in the boiler house. This installation is at one of the super-power stations, and the capacity consumption of this plant can be estimated by figuring that each car dumped has an approximate capacity of 120 tons, and many cars are unloaded each day. The reserve storage yard of this plant is also enormous. In contrast to this installation is the one shown in Fig. 10, where a mast and boom is used for unloading barges and two automatic car trestles, each equipped with 1½ ton coal cars, are used for distributing the coal on the ground storage.

For making a successful and economical layout of handling equipment to serve the coal storage pile, the shape of the ground area, its relation to the coal receiving, and boiler plant feeding points, the nature of the coal, and the capacity of the yard, also the receiving schedule must be given consideration. As shown in the illustrations, practically every type of materials handling equipment can be made to unload and distribute coal to the storage pile, but whether or not the equipment will do it economically depends largely upon the engineering and study brought to bear upon the problem before the installation is made. For example, in the small plant, shown in Fig. 6, a portable conveyor for unloading and piling the coal is no doubt economical, and where a larger storage area is demanded a mechanical unloader or feeder, and several portable belt conveyors, as shown in Fig. 8, can be used to advantage. In other cases, however, where the quantity to be handled runs into thousands of tons per year, it would be more economical to make an installation similar to that shown in Figs. 3 and 4. Here a portable car dumping arrangement unloads the cars and discharges direct to a feeding pit from which the gantry crane is able to serve the entire storage area. A different arrangement, without the mechanical car unloader, is shown in Fig. 24. Here the cars unload themselves by gravity and the gantry crane again distributes the coal.

What is true about outside storage handling facilities is also true of the equipment required for handling within the power plant. In some of the smaller power plants, no outside storage is required and small elevators and conveyors receive the coal from bottom dump hopper cars and immediately place it in the bunkers. Even some of the large central power plants try to do this wherever possible so as to eliminate additional handling. In most cases, however, a storage pile is required, but as most reclaimed coal is again loaded to cars for transportation to the power plant, we find that the same equipment

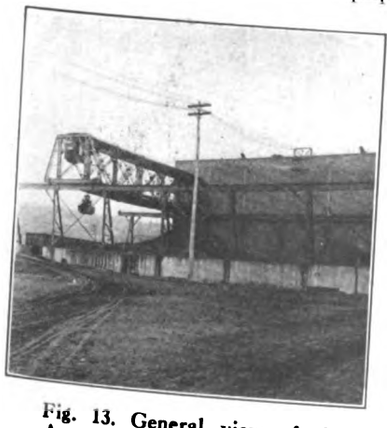


Fig. 13. General view of the American Brass Company, Waterbury, Conn., coal handling system.

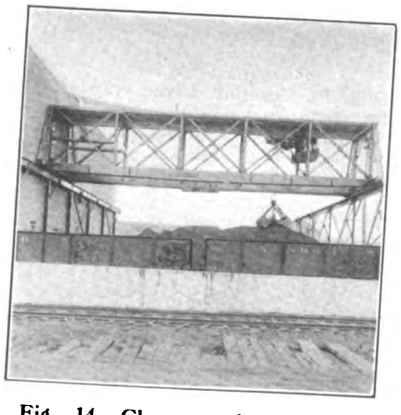


Fig. 14. Close-up view of the traveling bridge crane shown in Fig. 13. Note how a monorail telpher is used for the handling medium.



Fig. 15. Bucket elevators and various types of conveyors can be worked into a complete coal and ash handling system.

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Fig. 16. This drag flight conveyor receives coal on the bucket elevator shown in Fig. 15 and distributes same over the bunkers.

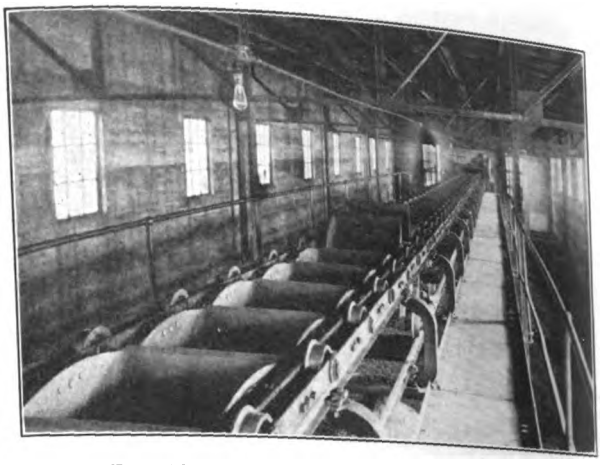


Fig. 17. Pivoted bucket conveyors are well-known devices for handling both coal and ashes.

can be installed providing the capacity to be handled per day is not too high. For raising coal from ground level and discharging same to bunkers, various types of equipment are used. One of the common forms for this purpose is a continuous elevator conveyor known as pivot bucket carriers, which can also be used for handling ashes under the boilers. In the smaller power plants various types of bucket elevators operating in conjunction with various types of conveyors are also used. For instance, Fig. 15 shows a bucket elevator which receives coal direct from the crusher and elevates it to the drag flight conveyor shown in Fig. 16, which distributes it over the bunkers. In other cases, belt conveyors are used for distributing to the bunkers, and if the coal being handled is smaller than two inch, or finely powdered, screw conveyors are frequently installed.

Other mechanical means are also used for distributing to the bunkers and Figs. 13 and 14 show how one company uses a transfer bridge crane, and monorail telpher system for the unloading, storing and handling of coal direct to the bunkers. Fig. 22 shows a larry car distributing coal to the bunkers and in some plants where physical layout permits the power house is located so that the railroad cars themselves dump direct to the bunkers above the boilers.

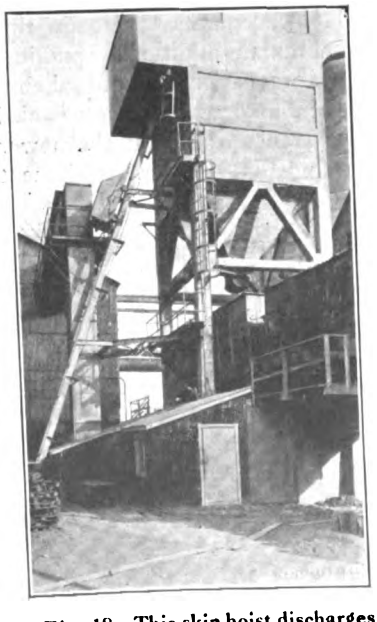


Fig. 18. This skip hoist discharges ashes to a concrete bunker. In the background can be seen the coal handling equipment.

In connection with the handling of materials, improvements in power plant operation have been made, and at the present time practically all new installations are being provided with methods of weighing the coal as it is received at the bunkers, and also as it goes to the various boilers. With the latter method the efficiency of each boiler can be checked at any time. Many devices have been made for the weighing of coal, and at the present time materials being handled by belt conveyors, beaded flight conveyors, or pivoted bucket carriers, can be weighed in transit. Where monorail telpher systems are used, it is simple to stop the load on a suspended scale for weighing. If larry cars are used for putting the coal into the bunkers they are generally equipped with a scale mechanism. For weighing the coal as it comes from the bunkers and is fed to the stokers, various devices are used. A traveling weigh larry for this purpose is shown in Fig. 20 and not infrequently when spouts from bunkers to stokers are installed, automatic scales are located at the bunker discharge points. Power house engineers have come to the conclusion that to keep up an efficient and economical power plant, it is essential to weigh the raw materials consumed, and it is even advisable to provide a method of weighing the coal fed to each boiler.

Fig. 19. Gasoline driven crawler type of crane shown is also being used in industrial plants for handling coal and ashes.



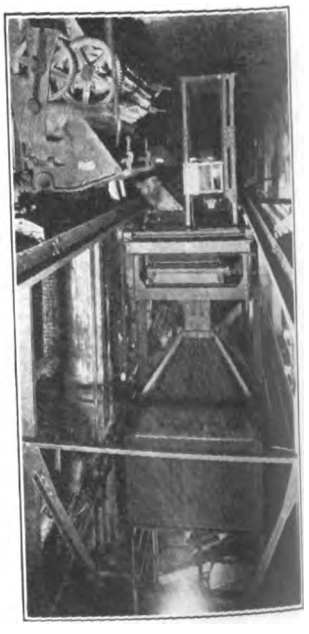


Fig. 20. Traveling weigh larries for distributing coal to stokers provides a means for checking coal consumption.

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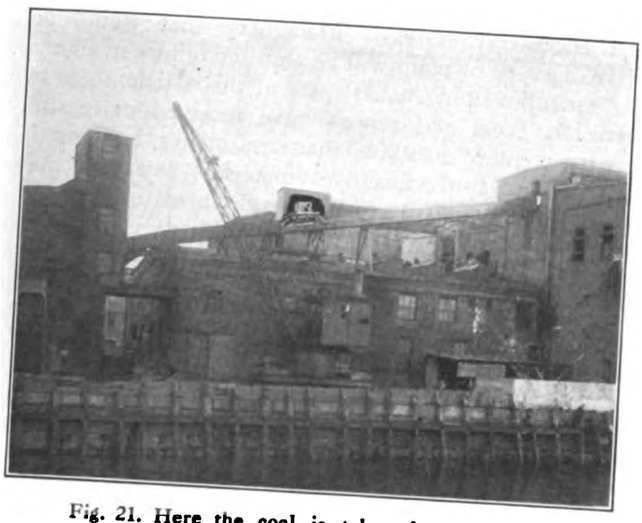


Fig. 21. Here the coal is taken from barges by means of grab bucket, deposited into the conveyor hopper and is weighed in transit when discharging to the bunkers.

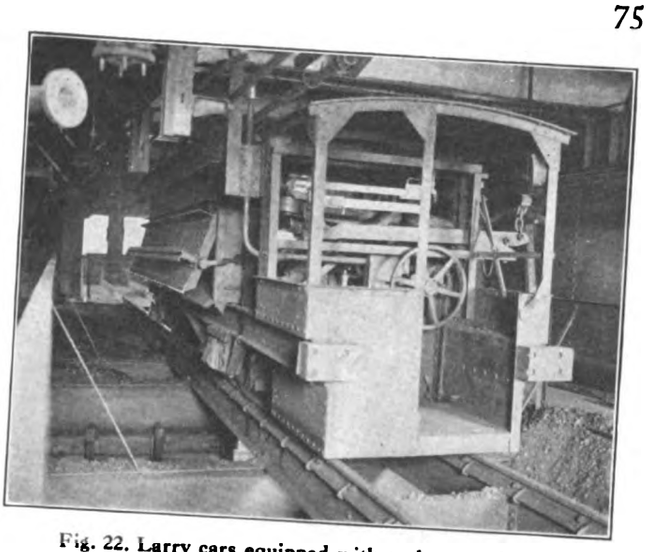


Fig. 22. Larry cars equipped with scales are also used for distributing coal to storage bunkers.

The most difficult handling operation in connection with power plant practice is ashes. The physical characteristics of this material is ruinous to most mechanical equipment. The proper method of handling ashes cannot be agreed upon by most engineers, and so throughout the country we hear of many complaints against the mechanical handling of this material. This is due to the fact that the average person does not take into consideration the nature of the product being handled. When we consider that the corrosive action of ashes is nearly three times as great as that of coal and that they are also abrasive, we can readily realize that ash handling equipment will require more maintenance than coal handling equipment.

In some plants ordinary drag chain conveyors are used for handling ashes, while in others industrial railway cars, feeding to skip hoists, have been found most advantageous. In plants where pivoted bucket carriers are used for handling coal, the same system of conveyors is also employed for the handling of ashes. In recent years steam jet ash conveyors have been installed. The opinions expressed by operators of ash handling equipment all seem to indicate that maintenance and close supervision, regardless of its type, is absolutely essential.

Some plants are so situated that it is unnecessary to store ashes for any length of time as they are either used for fill about the plant or can be sold locally for other purposes. The storage of ashes presents a difficult problem and engineers have devoted much time to studying this one feature. Various types of bins have been built and placed in operation, but definite recommendations cannot be compiled. There is a tendency, however, toward the building of concrete, or cast iron bins for the storage of ashes. A concrete bin erected for this purpose and the method of filling same with a skip hoist, also of discharging same to cars, is shown in Fig. 18.

Coal handling methods and problems of ash disposal must necessarily be solved on the ground for each individual power plant. Plant conditions and layouts must determine largely the most economical

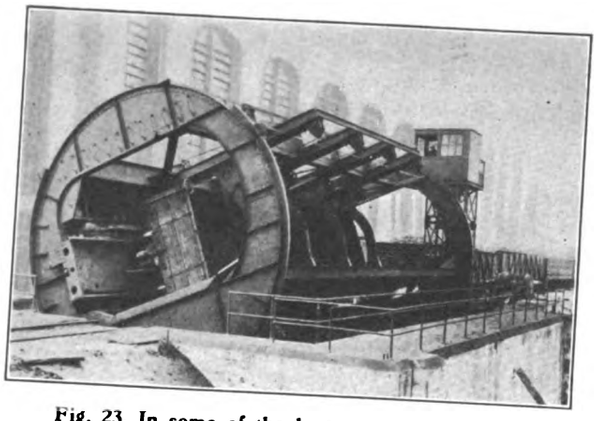


Fig. 23. In some of the larger super-power stations six car dumpers discharge direct to conveyor systems.

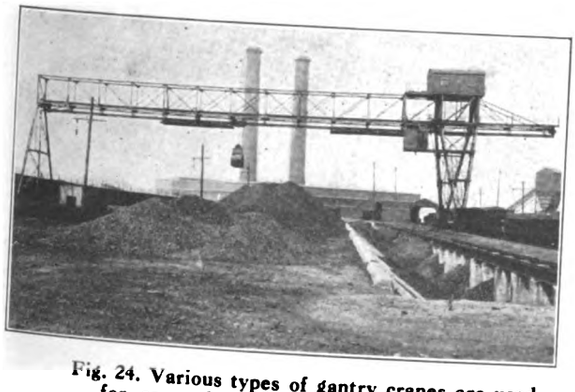


Fig. 24. Various types of gantry cranes are used for car unloading and storage handling.

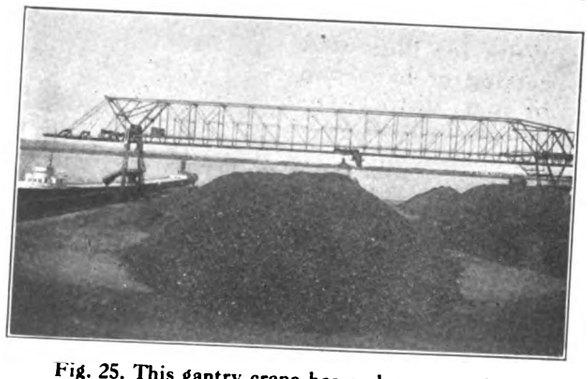
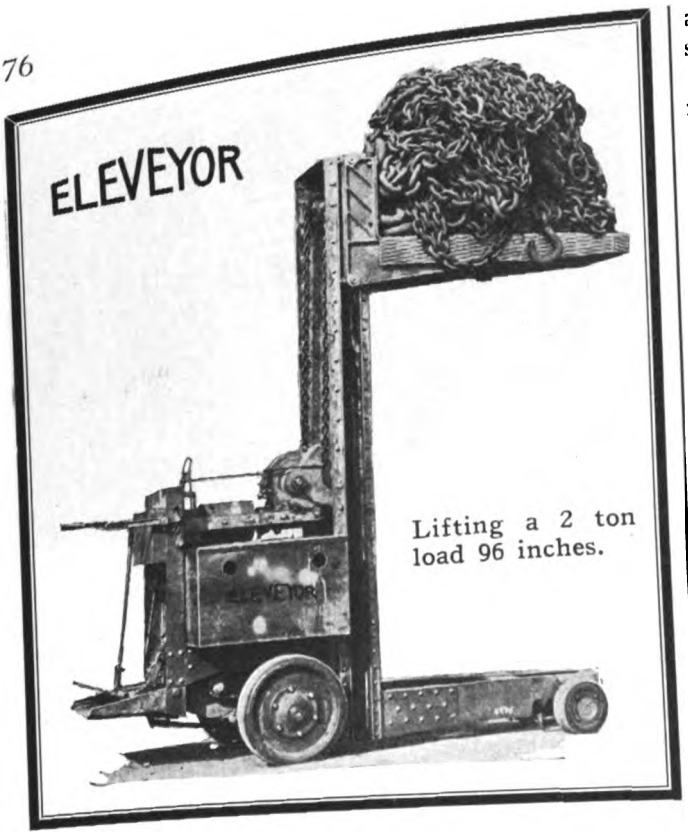


Fig. 25. This gantry crane has a clear span of 550 ft., an overall length of 720 ft. and is 120 ft. high to the top cord; and is the largest structure moving on wheels under its own power in the world.

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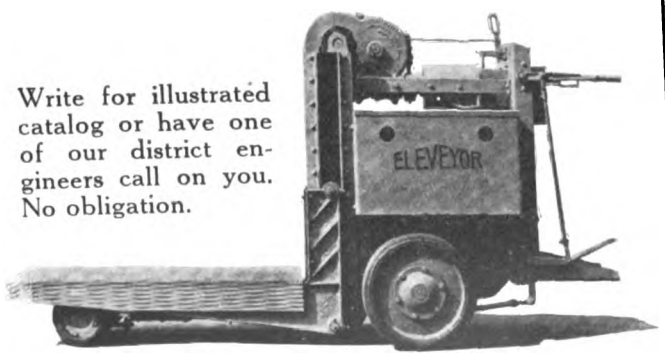
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and successful system. Machinery that would best serve one type of plant will be an utter failure in another.

As mentioned in the first part of this article, these two materials (coal and ashes) have received more study from a point of handling than any others, and for this reason the manufacturers of materials handling equipment are in a position to build equipment to meet practically every condition. Therefore, there is no reason why hand and foot labor should be used in power plants for handling these materials. Did you ever stop to think that the biggest part of the labor problem in connection with the power plant has to do with materials handling? When you have solved the problem of economic handling of coal and ashes you have gone far towards the solution of your power plant labor costs.

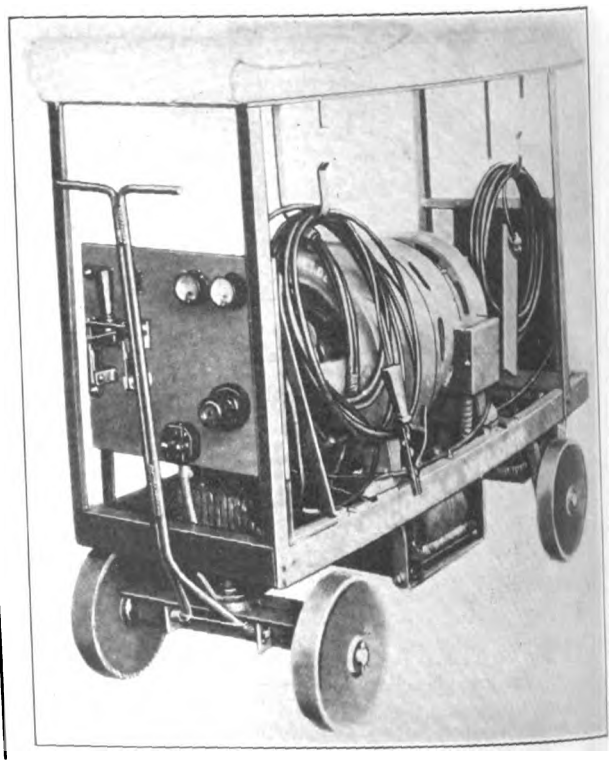
A New Electric Welder

THE Lincoln Electric Company of Cleveland has put on the market a new welder especially designed for use in railroad shops. The equipment is said to afford unusual ease of operation and to be especially well adapted to its particular field because of its relatively narrow width.

The builders of the equipment report that actual tests show the welder to give the greatest possible capacity for work in railroad shops. Such roads as the Pennsylvania, Chicago and Northwestern, Erie and the New York Central have already installed the Lincoln product.

The Lincoln Railroad Welder is but 21 inches wide, so that it will easily pass through the narrowest alleys in a shop. Through the use of large roller bearing wheels it has been made easily portable.

The weight of the machine is low to the floor so that it will not tip over. The frame is of structural steel, extending beyond the equipment on the truck, so that it is almost impossible to back the truck into anything which would damage the welder.



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An enterprising truck owner in the vicinity of New York has adopted this slogan as a means of advertising his business.

Every industrial plant in America could well adopt this same slogan as a means of increasing its profits.

A million dollars a word for each of the eight words in this simple slogan is not an excessive value at which to appraise the profit-earning power of the principle which it exemplifies. Many concerns have found that the practice of this principle has been worth a great deal more than eight million dollars.

All profits and progress in industry come through keeping things moving. While this principle applies to all departments of a business, nowhere does it apply more strongly than to *production.* The profitableness of a business is not measured by gross annual volume but rather by *inventory and capital turnover.*

Rapid inventory and capital turnover are secured only when the individual materials and parts of the product move into, through and out of the plant in the shortest practical length of time.

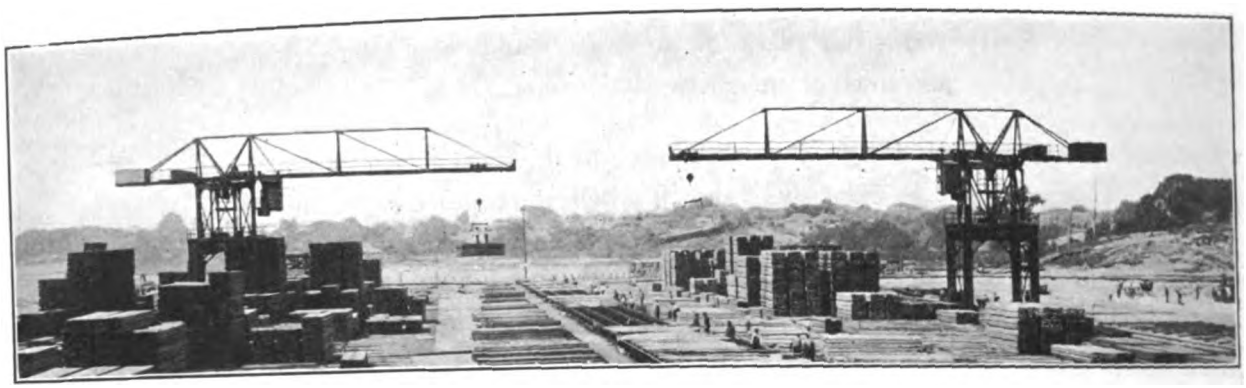
The most feasible way and, in fact, the only way to increase the turnover and shorten the production cycle is to invest in a definite form of insurance so that materials and parts cannot stand still but *must* keep moving. The most effective insurance against slow turnover is represented in modern materials handling methods and equipment.

The following pages form a permanent reference guide to the modern handling equipment that is being used by progressive plants to insure rapid turnover and increased profits. Keep and study this issue as the most complete treatise on modern handling yet published.

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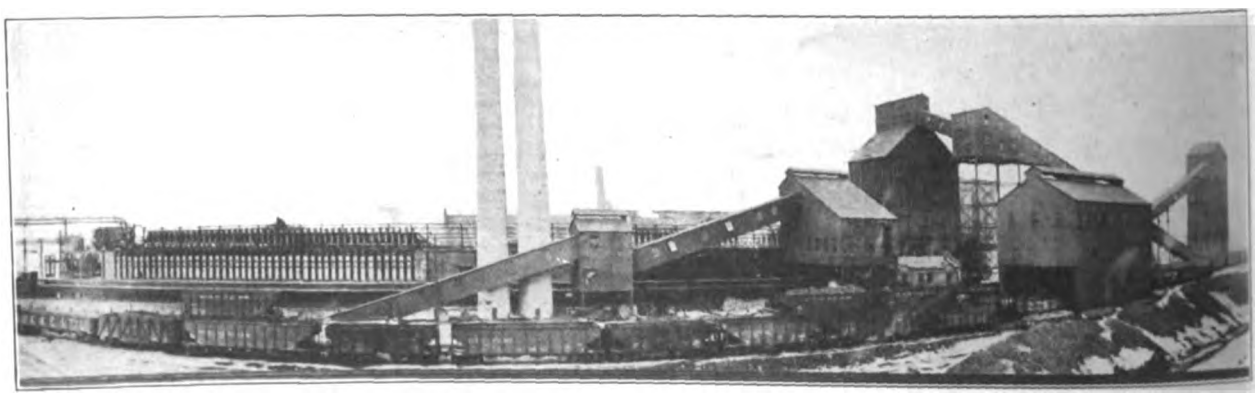
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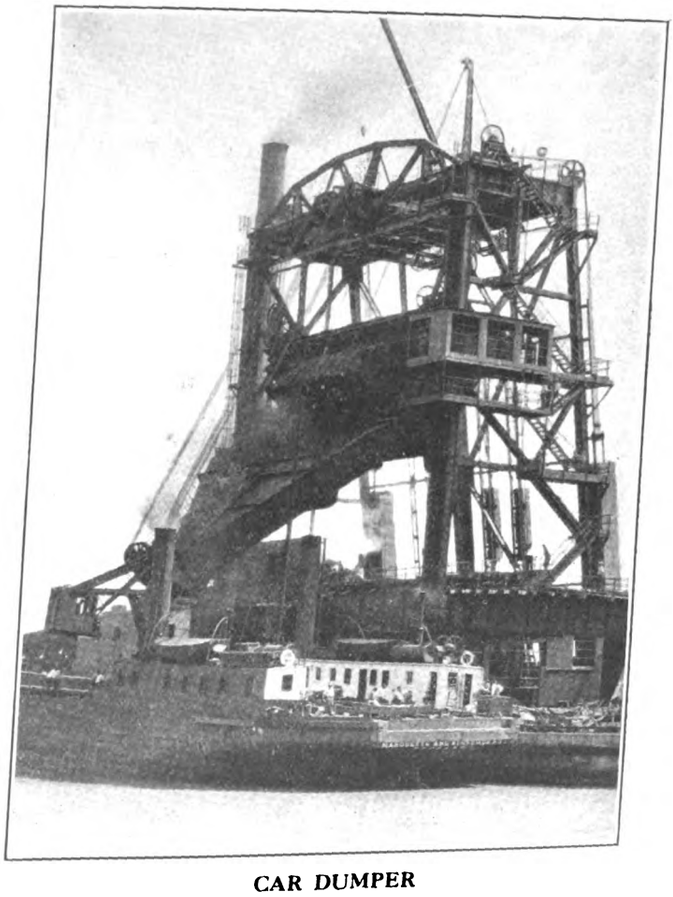
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A Definite Plan of Action

for executives who would strike out wasteful methods of handling materials

THIS is a straight-to-the-point message for executives who have read this issue of Industrial Management—who, having read, wish to take action.

If you are such an executive, we believe you have one of three things in mind:—

(1) You want more information. You want to know more about the most modern methods of handling materials—how these methods have cut manufacturing costs in your particular line of business—the possibility of adapting these methods in your own plant.

(2) Or, at the moment, you are interested in some specific material moving operation in your plant. For example, you may wish to speed up the movement of certain production materials through a series of manufacturing operations; you may wish to cut down your present labor cost for moving the finished product from factory floor to shipping platform or warehouse; or perhaps your specific problem is one of finding a more efficient method of handling raw materials.



A comprehensive booklet, replete with actual installation photographs, which will give you an unusually vivid picture of modern material handling methods that are today cutting costs in many diversified lines of business.

(3) On the other hand, you may be thinking about the material handling activities in your plant as a whole. You may desire to have a complete survey made, to determine where the inefficiencies, if any, lie—how they may be eliminated—how much you could save by installing a comprehensive system of mechanical handling throughout your plant.

Whichever you have in mind, we have a definite plan of action that will mesh with your particular interest and problem.

The service we are prepared to place at your disposal is complete in every detail.

First, we have a back-ground of manufacturing experience covering a period of over a 100 years; we have a sympathetic understanding of manufacturers' problems; we understand and speak the language of the "shop."

Secondly, we have a staff of long-experienced material handling engineers—men who know the practical as well as the theoretical side of material handling; who live in the atmosphere of the shop and have first-hand knowledge of production problems.

Thirdly, we have an organization equipped to design and manufacture material handling equipment of almost every type.

Fourthly, we have a standard line of material handling equipment which can be adapted to a wide range of requirements—an advantage which in most cases results in a decided saving in equipment cost.

To secure the form of service which will exactly meet your requirements, we suggest that you write our nearest office below. Simply explain briefly what you have in mind—a desire for further information, a specific material handling problem, a particular type of material handling equipment, or a complete survey of your material handling activities. This action does not obligate you in the slightest.

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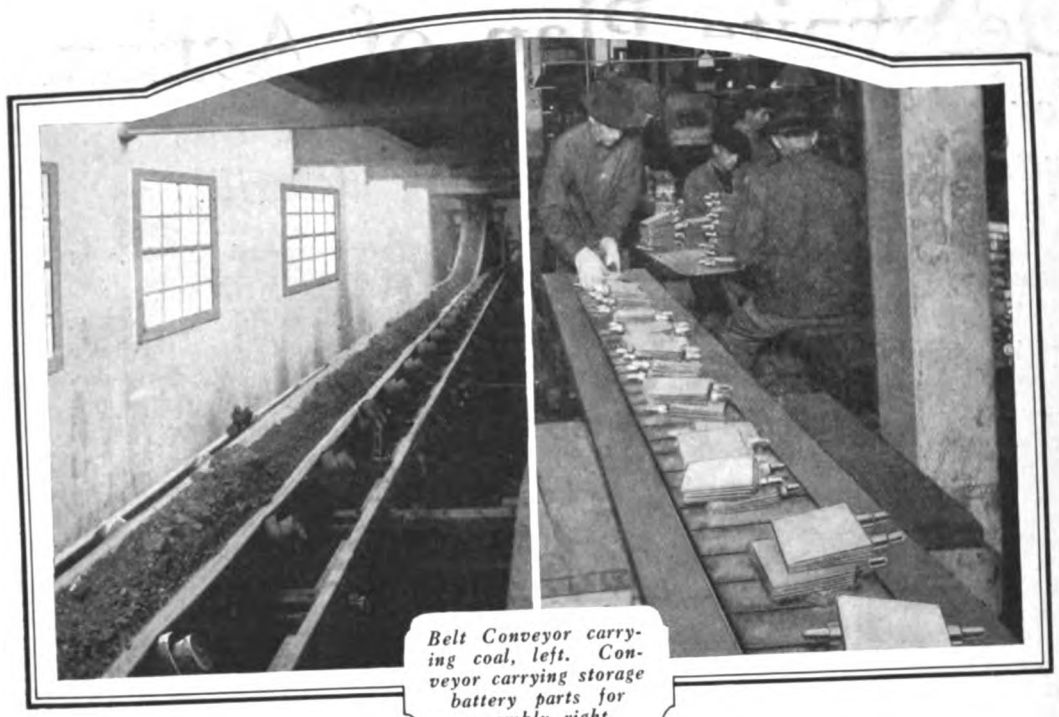
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Belt Conveyor carrying coal, left. Conveyor carrying storage battery parts for assembly, right.



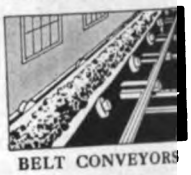
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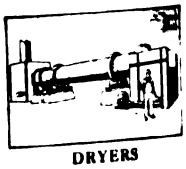
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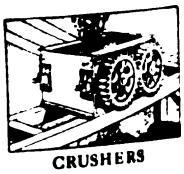
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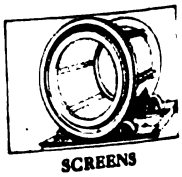
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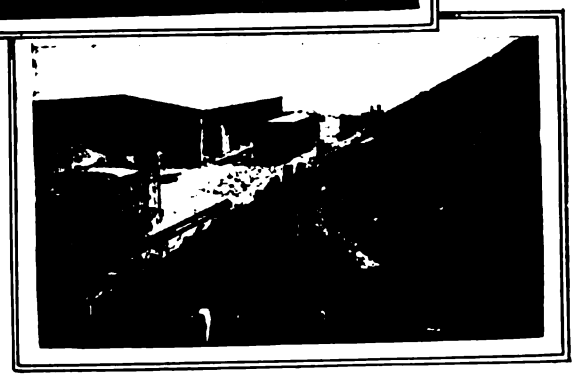
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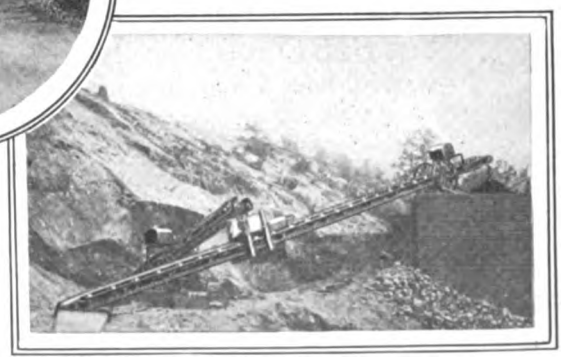
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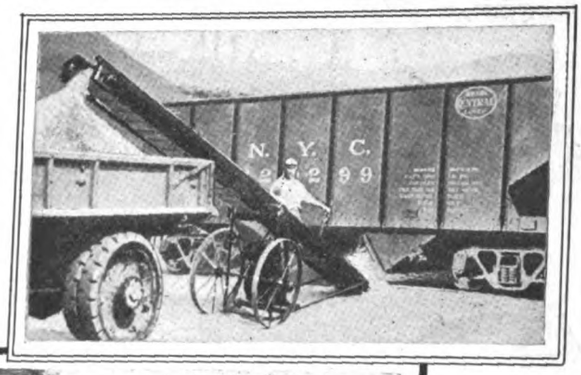
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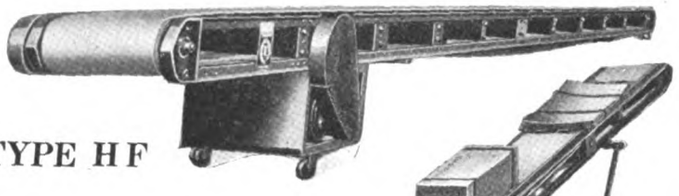




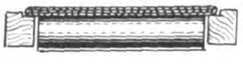


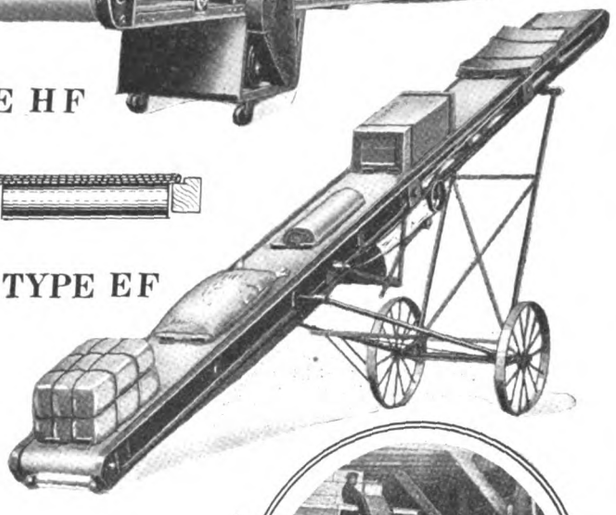
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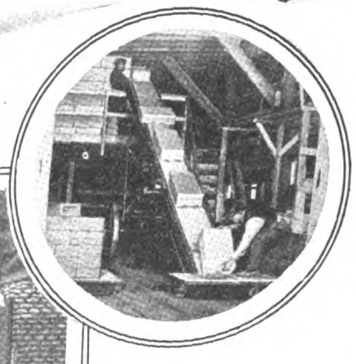
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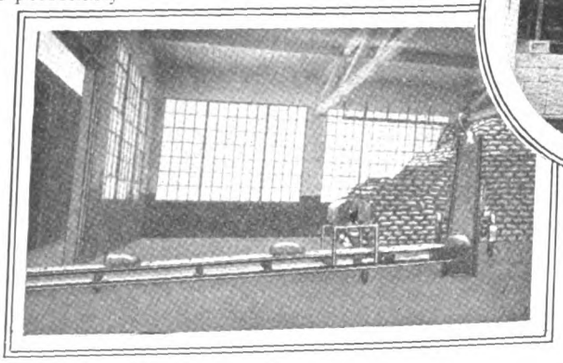
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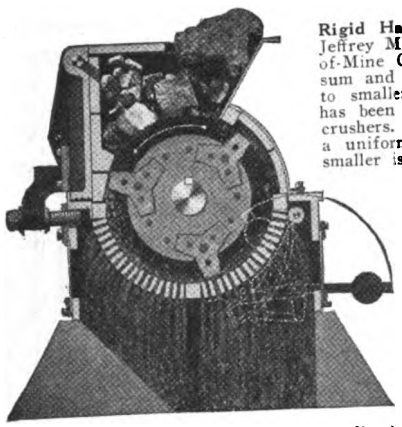




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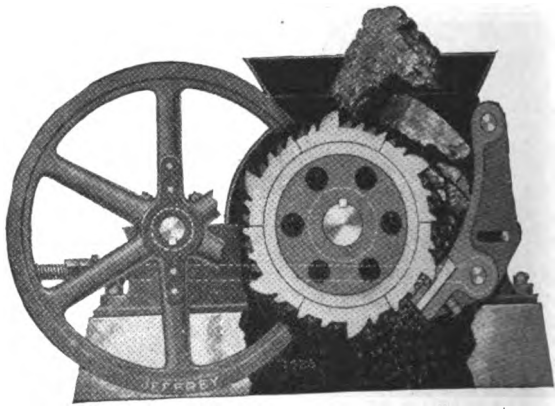
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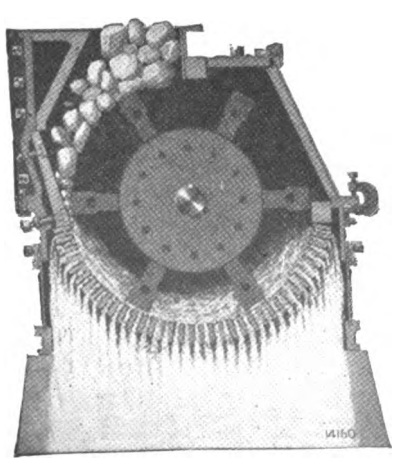
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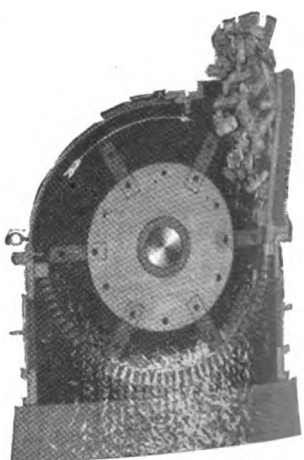
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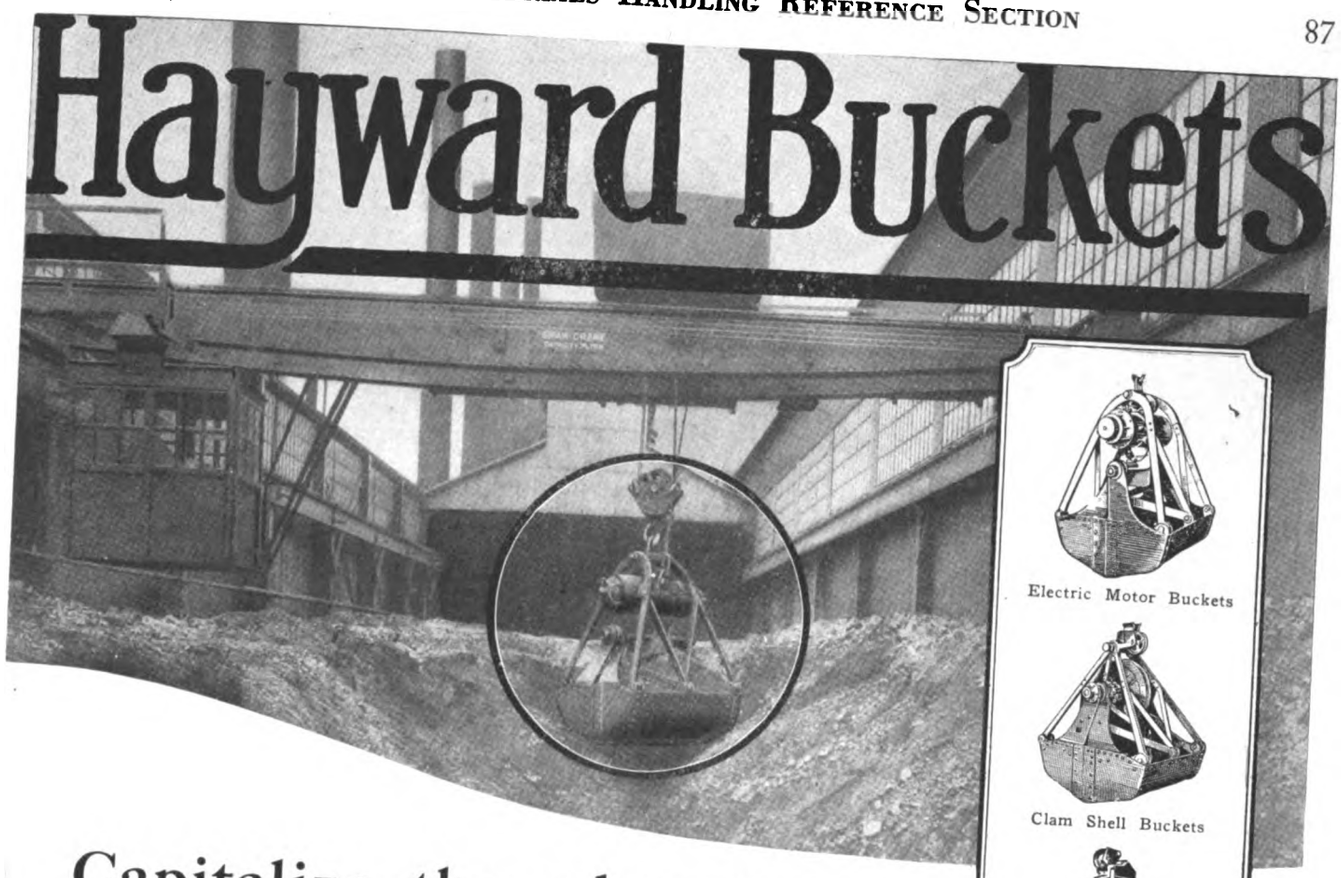
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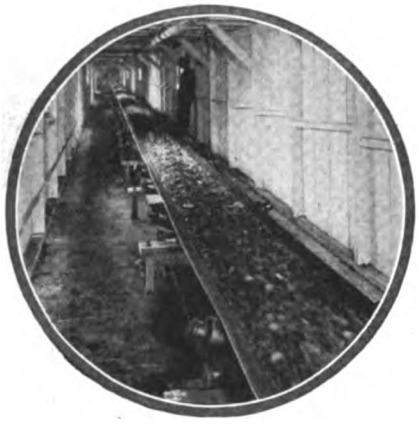
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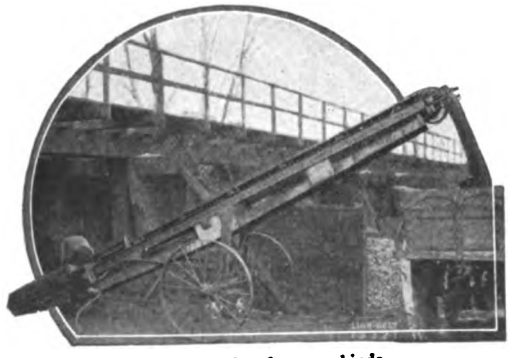
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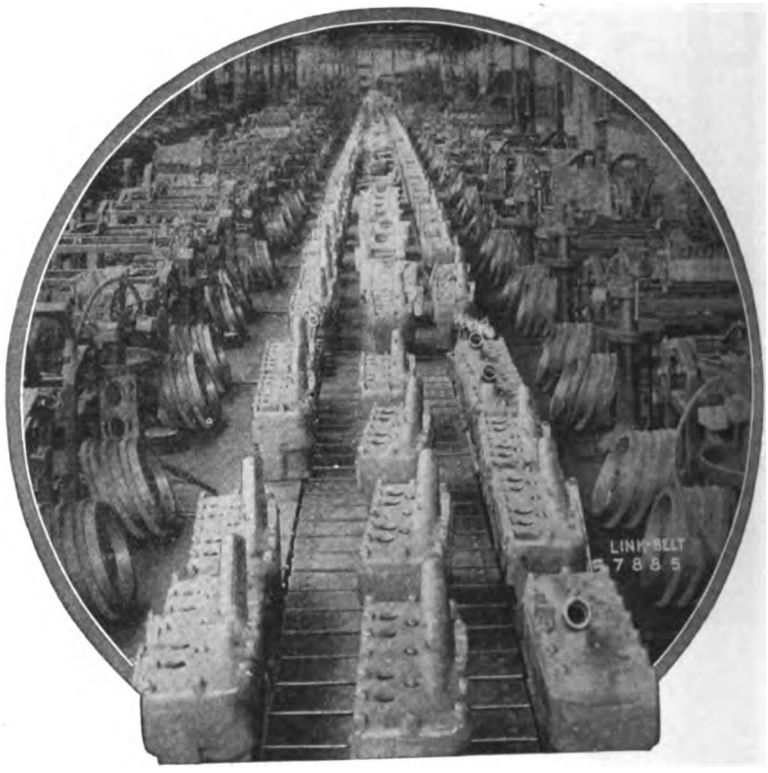
"Six Machines In One," the Link-Belt Gasoline Crawler is used with sling, grab bucket, shovel, ditcher, dragline, or pile driver. Ruggedly built, fast and powerful in operation, it repays its cost many times. Write for Book No. 795.



Opportunities for cheaper handling, with Link-Belt Conveyors, are numerous. Suitable for light or heavy, raw or finished materials. Operate at any desired speed, over long or short distances. Write for the Belt Conveyor Book.



Loose, heavy materials of many kinds are handled with less cost in many industries by Link-Belt Portable Loaders. Used for moving material from cars to storage, to trucks, etc. Made in sizes to fit any condition. Ask for Link-Belt suggestions.



Put Your Conveying, Transmission Prob

AFTER READING THIS ISSUE you must be convinced that it pays to use the most efficient mechanical means for handling materials and transmitting power.

THERE MUST BE many opportunities in your plant to effect great savings in costs as well as increases in production, through the use of more efficient material handling devices and power transmissions.

THAT'S WHY IT WILL PAY you to put your elevating, conveying and power transmission problems up to experienced Link-Belt engineers.

FIFTY YEARS' EXPERIENCE, during which time we have designed and built thousands of elevators and conveyors and fitted them into the individual conditions and requirements of the user, is at your service.

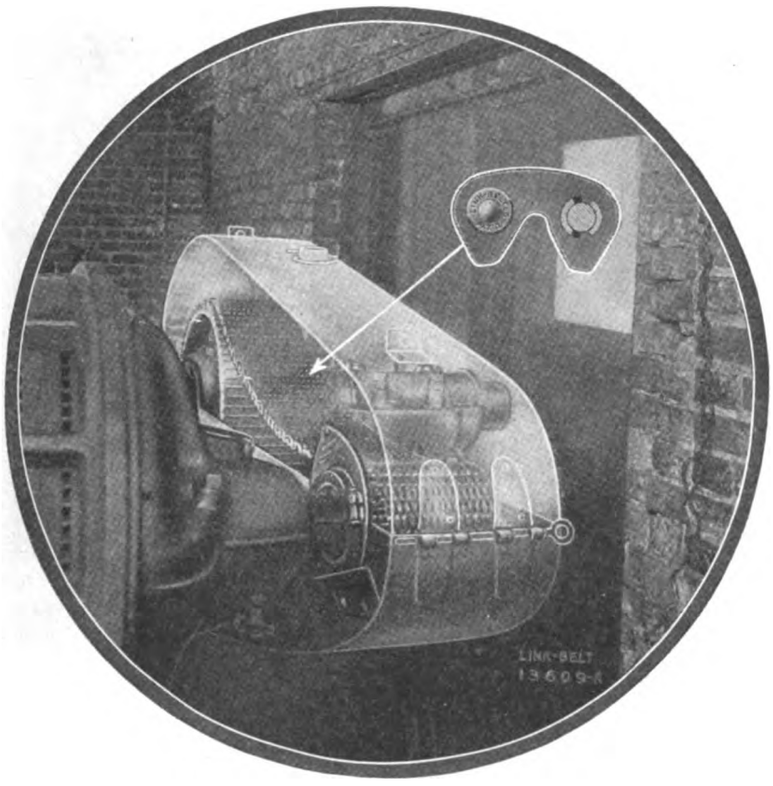
LINK-BELT MANUFACTURES complete in its own plants every type of modern equipment

LINK-BELT

50 THIS YEAR LINK-BELT IS FIFTY YEARS OLD

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Elevating and Power lems up to Link-Belt

for handling materials, and for transmitting power most efficiently from motors or lineshafts to machines.

THE ADVANTAGES OF SPECIFYING LINK-BELT EQUIPMENT are three fold: First, every unit is properly fitted to your individual requirements by experienced Link-Belt engineers. Second, every Link-Belt unit is made to meet the most exacting standards of manufacture—it must give the maximum results in service. Third, Link-Belt's interest in the performance of your equipment never ceases.

WHATEVER YOUR NEEDS MAY BE, now—or in the future—if it concerns better ways and means of handling materials or transmitting power, it will pay you to put it up to Link-Belt.

Descriptive catalogs sent on request. Address

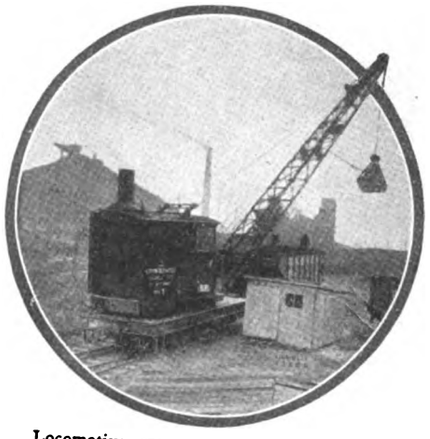
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Leading manufacturers of Elevating, Conveying and Power Transmission Machinery

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Locomotive cranes are built by Link-Belt in various sizes and with booms up to 110 feet. Operate on standard or narrow gauge track. Have attachments suitable for many uses around a plant. Many have been in service for 20 years. Write for Book No. 670.



Coal, ashes, cement, sand—these and many similar materials may be transported horizontally, vertically, or at an angle with the Peck Pivoted Bucket Carrier. Used in scores of power plants. Practically automatic in operation and gives years of reliable service. Write for Book No. 720.



Portable Bucket Loaders for handling coal, sand, fertilizer and other materials are made in various types.

LINK-BELT

2324

THIS YEAR 50 LINK-BELT IS FIFTY YEARS OLD

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1—An electric driven "U" loading wagons for the Consumer's Company, Chicago. Notice how easily two men can keep the machine going to capacity.

2—A Barber-Greene "U" unloading a box car of anthracite in 4 hours for the Lorr Brothers Coal Company, Chicago. Wheeling is eliminated and but two helpers are used.



Tear this out and send for "Mr. Barber's Scrapbook" and complete information on the "U" Conveyer.

Name .....

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3—A series of Barber-Greene "U" Conveyors handling oyster shell for the H. C. Rowe Co.







4—A "U" loading sand in a sand pit. Notice how the sand is screened. One man loads 3 yards in 15 minutes. Two men load 3 yards in 5 minutes.

5—A Barber-Greene "U" loading brick into trucks from a kiln for the Onondaga Brick & Tile Co., Onondaga, New York. This is a good way to shorten and eliminate wheelbarrow hauls.

$448 That Tell High Handling Costs Good-bye

What the low price of $448.00 for the Barber-Greene "U" equipped with a 3 phase, 60 cycle, 220 volt, electric motor, means is almost self evident.

For an exceptionally low investment from two to ten men, depending upon the routine of the work, can be eliminated from the yard gang payroll. With competition as keen as it is, such a reduction of handling costs, and hence production costs, is obviously desirable.

For instance, the Barber-Greene "U" reduces the car unloading gang to one or two men. It has a cleated belt—and a low charging end that can be easily nosed beneath hopper-bottomed cars. These two features help the Barber-Greene "U" to unload from 200 to 400 tons of coal, or a proportionate quantity of gravel or other materials, per day.

That means good-bye to slow, inefficient unloading—good-bye to high unloading costs—good-bye to excessive labor turnover—good-bye to an extra production charge. The Barber-Greene conveying belt is edged with clips that provide a troughing effect, and eliminate wear between the belt edge and the conveyor frame. Two steel channels make a husky, rigid conveyor frame.

The Barber-Greene "U" is a he-man conveyor in a small size. Its cleated belt carries the large lumps that the ordinary baby conveyor can't handle. The discharge end can be quickly raised from five to twelve feet. That reach enables it to fill ordinary bins, build small stock piles, work into sheds, and to load trucks or cars.

Now check all these things against the price of $448.00. Check the men that can be saved, check the features that assure long life and fast handling. Then check the coupon for additional information on this fast, low-priced conveyor.

The Barber-Greene "U" may also be had equipped with a 4 h. p., Fuller Johnson, gas engine, $485.00, or with an electric motor that meets your needs. Prices on different types of power vary slightly, and are reflected in the price to the user.

BARBER-GREENE COMPANY—*Representatives in 50 cities*—500 W. Park Ave., Aurora, Illinois

BARBER GREENE

Portable Belt Conveyors Self Feeding Bucket Loaders

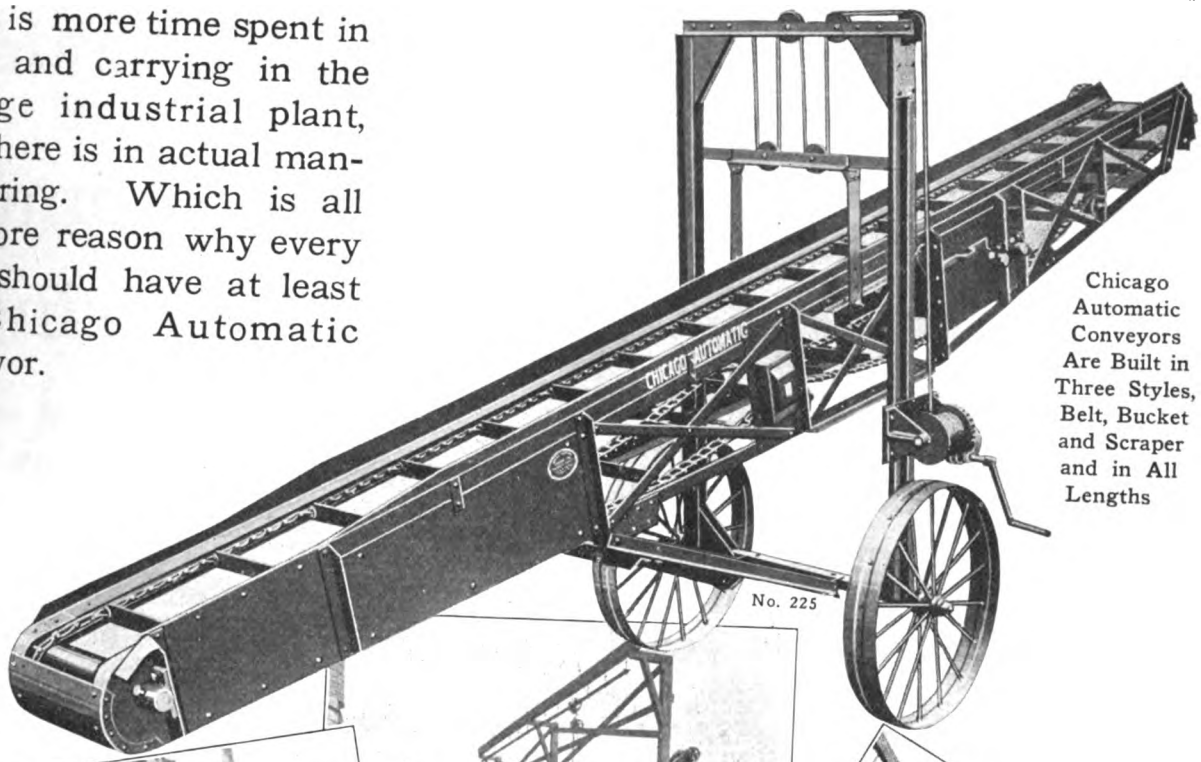
Coal Loaders . . . . Automatic Ditch Diggers . . . Coal Feeders

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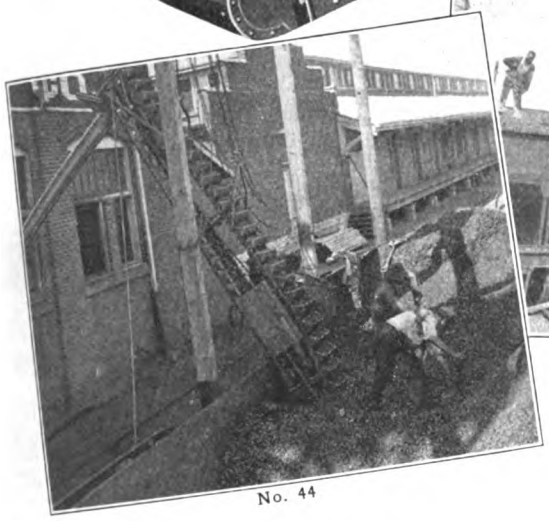
Every Plant Can Use A CHICAGO AUTOMATIC CONVEYOR

There is more time spent in lifting and carrying in the average industrial plant, than there is in actual manufacturing. Which is all the more reason why every plant should have at least one Chicago Automatic Conveyor.



No. 225

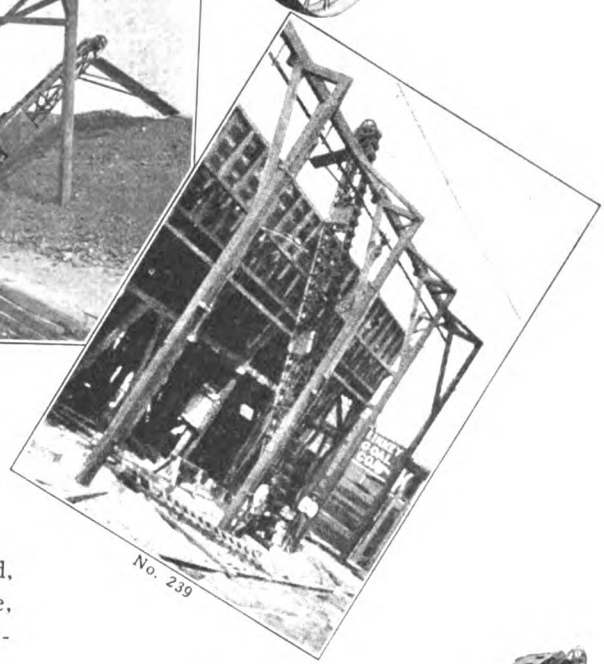
Chicago Automatic Conveyors Are Built in Three Styles, Belt, Bucket and Scraper and in All Lengths



No. 44



No. 110



No. 239

Starting with the delivery of bulk material—coal, ore, sand, gravel, etc.—Chicago Automatic Conveyors can unload, pile, distribute, carry, raise to proper floors and otherwise perform all the operations of a gang of shovelers and laborers. But there is a great difference in costs!

Look around your plant now; isn't there several places where a Chicago Automatic Conveyor will lower your handling charges? As there is a type and size for every purpose, why not effect this saving now by writing us for full information?



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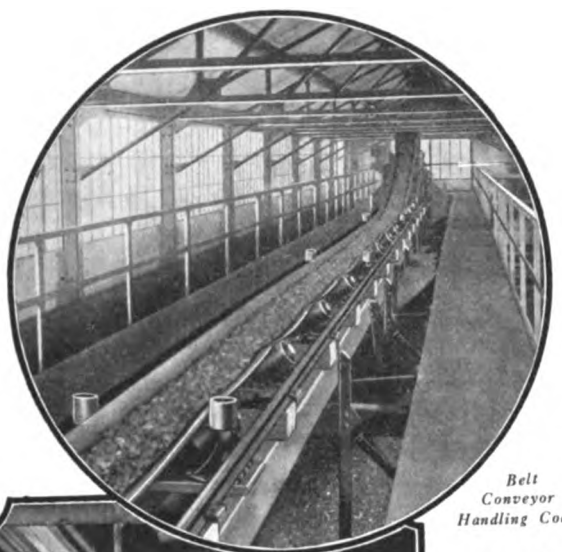
Chicago Automatic Belt Type Conveyor

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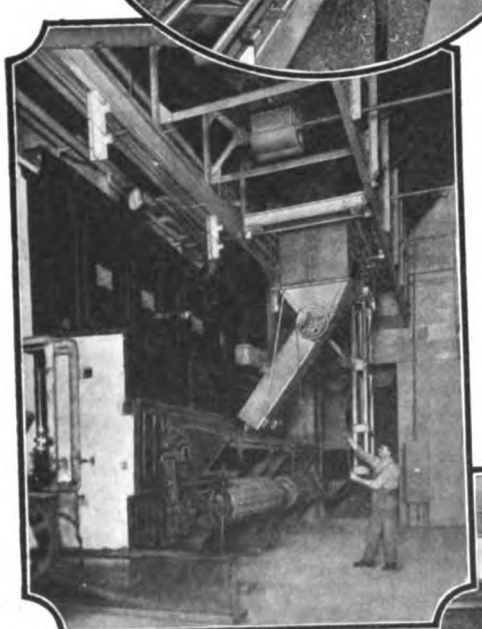
Webster

Mechanical Handling Equipment for "Enduring Satis



Belt Conveyor Handling Coal

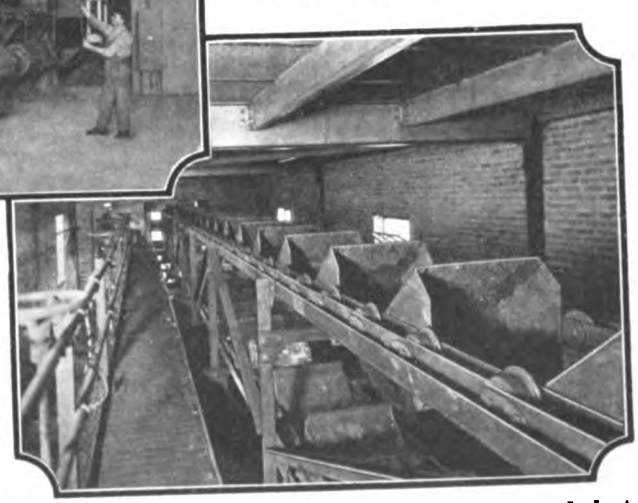
The correct handling of coal and ashes in the power plant as well as handling packages, bags, boxes and bulk materials in industrial plants, has been the major study of Webster engineers, and the many installations in every industry testify to the guarantee of every piece of Webster equipment, "Enduring Satisfaction Assured."



Traveling Weigh Larry Distributing Coal to Stokers

Webster equipment—belt conveyors, bucket elevators, pivoted bucket carriers, bag and package elevators, platform conveyors, and all types of coal and ashes handling equipment, are all proven and tested thru nearly a half century of experience. And all are noted for durability and reliability of operation at all times.

Webster engineers will be glad to go over your handling methods and make suggestions as to



"V" Bucket Elevator-Conveyor Carrying Coal to Bunkers

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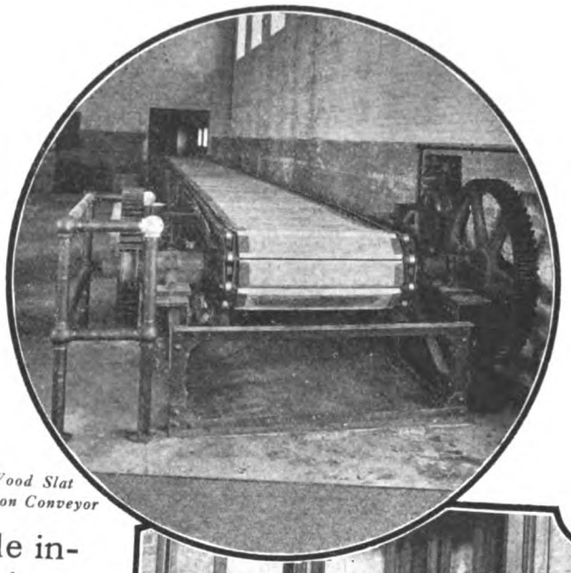
Cutting Costs in Industrial Plants

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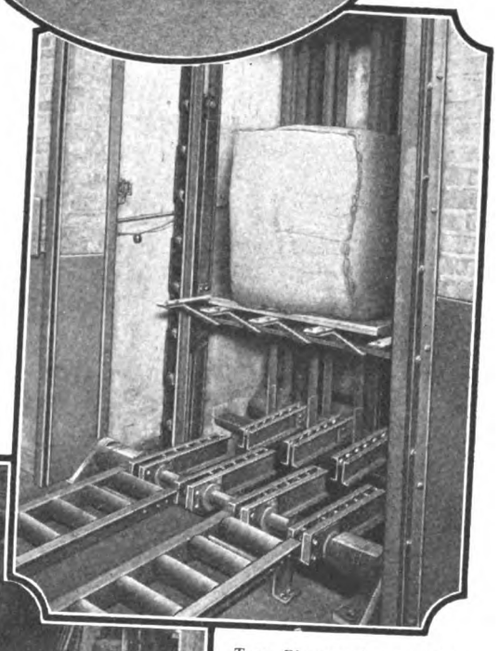
the best type of equipment to meet your particular requirements. They are at your service.

The Webster General Catalog No. 48 is a complete treatise on Mechanical Handling Equipment. It describes in detail elevating, conveying and power transmission machinery, chains, sprockets, buckets, takeups, gears, and all similar equipment used in lowering the cost of handling. It contains 700 pages of valuable information compiled at considerable expense. A request on your letterhead will bring it to you. Write giving your position or title in the concern with which you are connected.

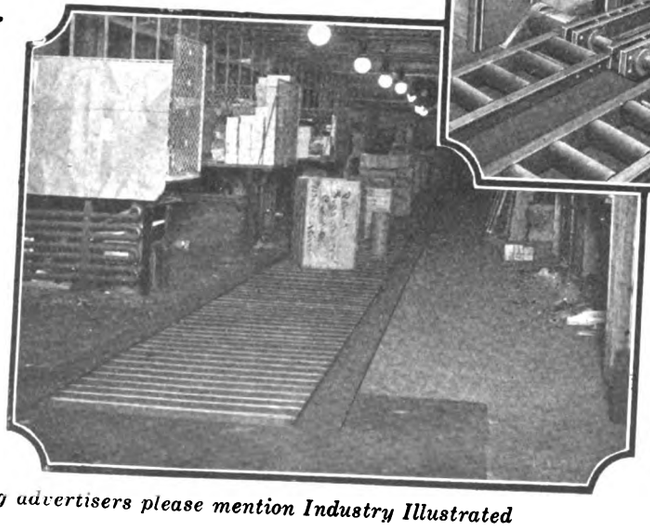
We shall also be glad to send you a copy of our magazine "Webster Method" which gives complete information on recent Webster material handling installations in industrial plants.



Wood Slat Apron Conveyor



Tray Elevator for Handling Bags and Cases



Platform Conveyor Handling Boxes

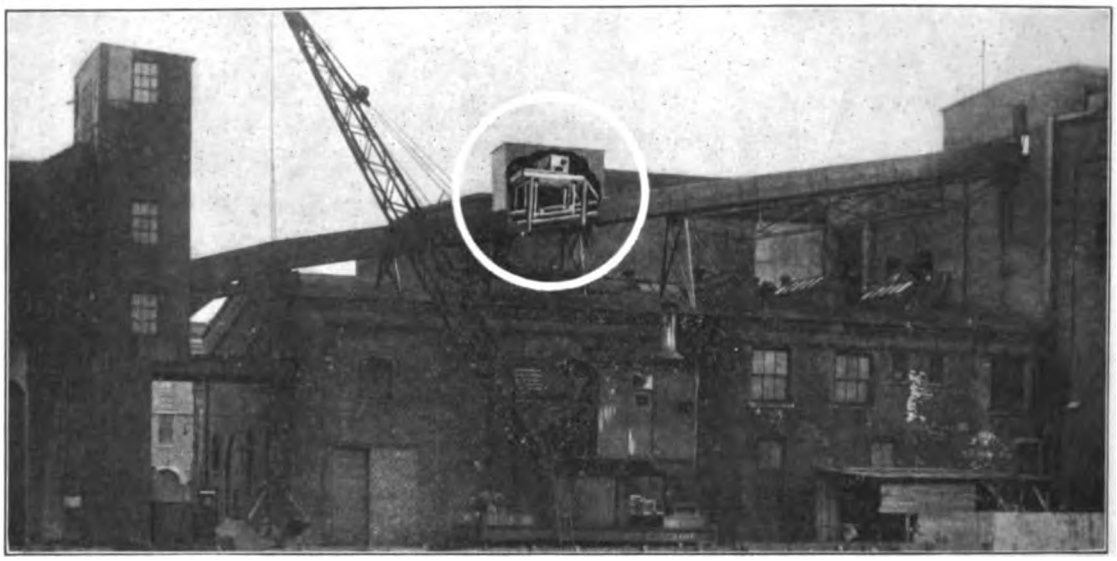
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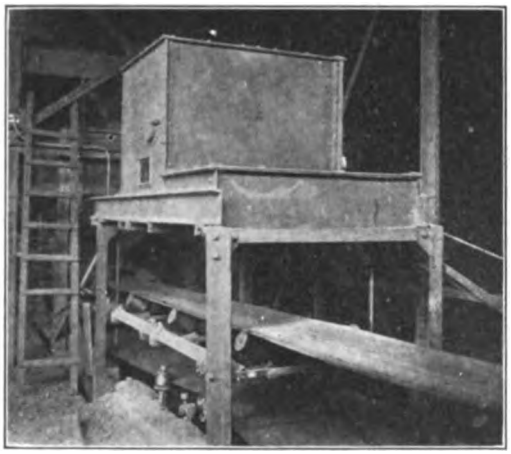
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Three Hundred Thousand Tons of Coal Bought Annually Over Merrick Conveyor Weightometers



Typical Installation Merrick Conveyor Weightometer

Materials Whose Weights Can Be Checked by the WEIGHTOMETER

Coal, Coke, Fertilizer
Ore, Sand, Stone, Gravel
Finished Cement, etc.

THE amounts shown as delivered on your bills of lading may be correct; and then again they may not be. You have no check unless your conveyors are equipped with Merrick Weightometers.

Then you have a 99% accurate check on all conveyor handled materials—ore, sand, stone, gravel, coal, coke, finished cement, etc., etc.—and without stopping operations since the weighing is done as the materials move along.

The need for an accurate knowledge of how much material is handled has never been more necessary than right now. Costs are too high for "guesses" to be tolerated; you must know—and the Merrick Weightometer will tell you. For checking receipts, shipments and inter-plant movements, the Weightometer is ideal.

The "Merrick Catalog" will tell you more —send for it.

Merrick Scale Mfg. Company

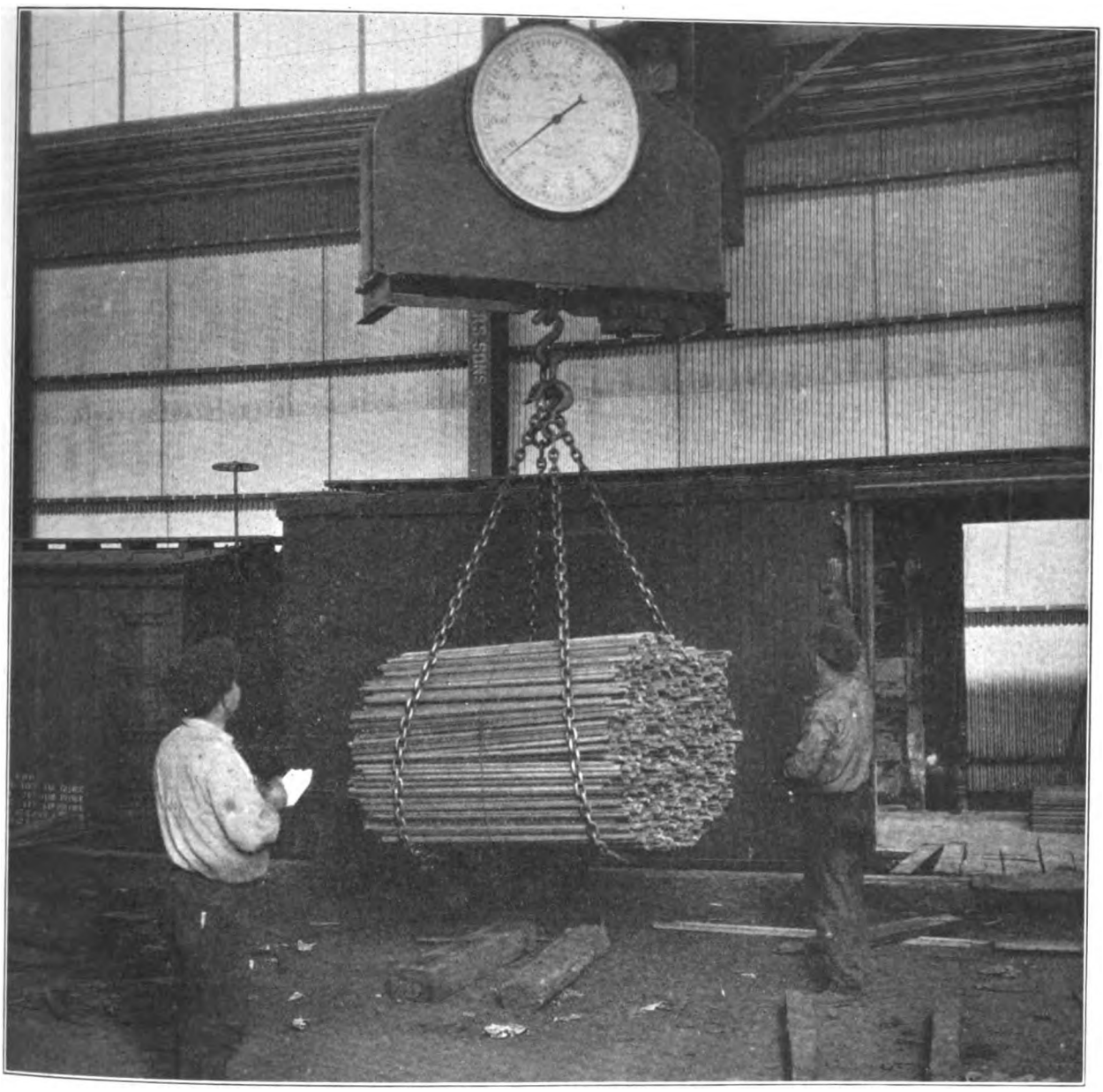
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Weigh it While You Move



The Calumet Steel Company, Chicago Heights, Illinois, have eliminated all weighing troubles, errors, etc., since installing this KRON SCALE.

"We couldn't get along without Kron Scales," says L. H. Hook, Works Manager. With these scales attached to the crane they can pick up, weigh and load steel into freight cars all in one operation.

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams—no springs. **Simply load and look.**

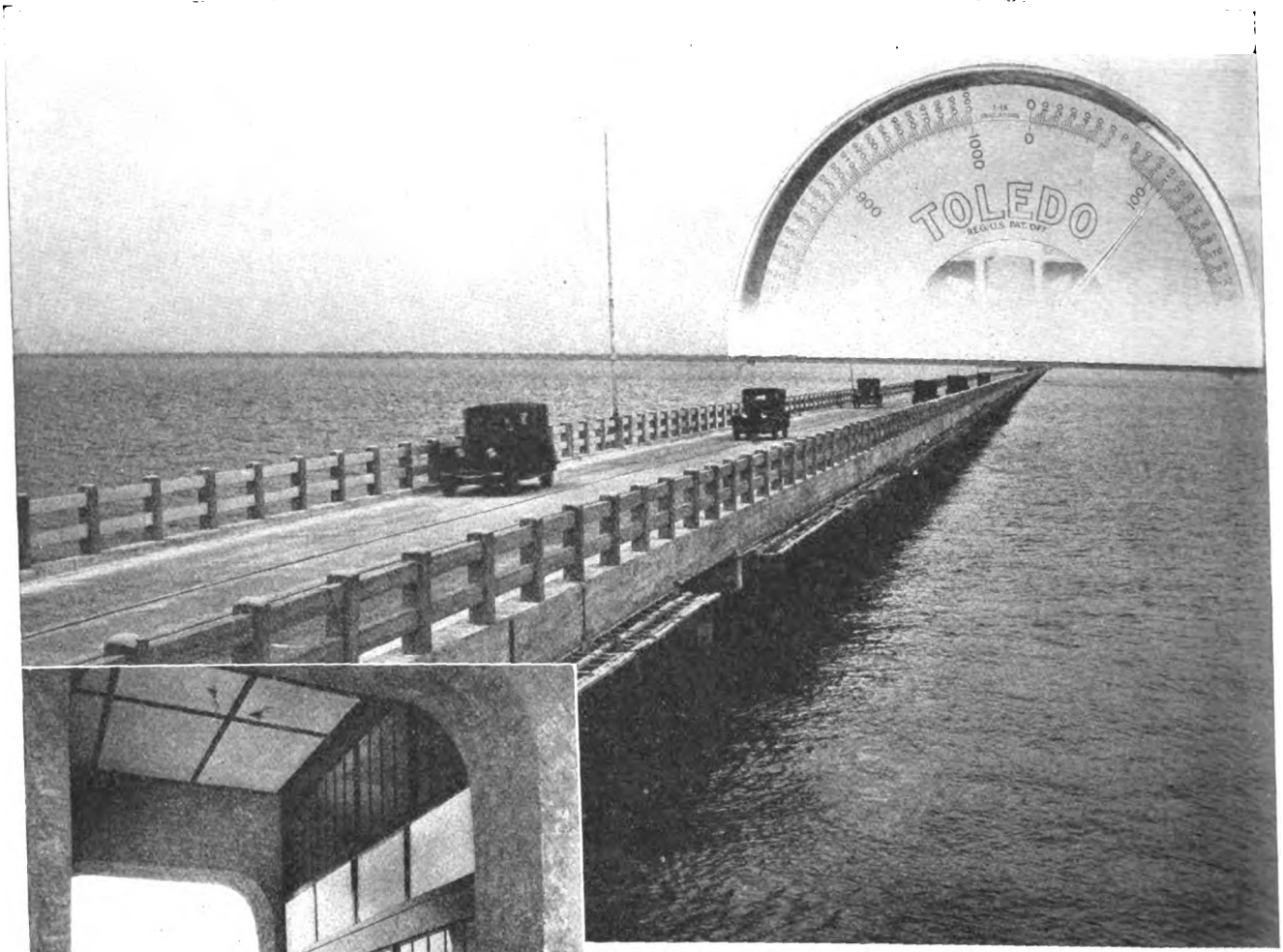
Write for a copy of our 62 page catalog describing all the various types.

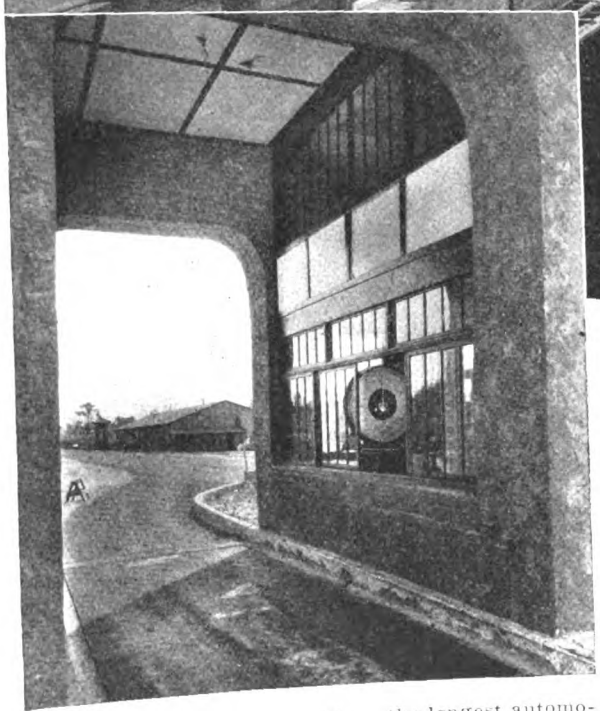
KRON SCALES

The American Kron Scale Co.
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This is the noted Gandy Bridge—the longest automobile bridge in the world—stretching across Tampa Bay between Tampa and St. Petersburg. At each end of the bridge is a Toledo auto truck scale, built to receive a load of fifteen tons and to instantly indicate the exact weight on the big automatic dial. The dials of these scales are marked in zones with computations in plain figures to correspond with the schedule of rates, so that the bridge tender and driver both can see at a glance the amount to be charged for the load.

Great Toll Bridge Increases Revenue With Toledo Scales

FOR several months after the Gandy Bridge was opened no scales were used and the cashiers were necessarily compelled to accept the word of the drivers as to the gross weight of their trucks. With the installation of Toledo auto truck scales at each end of the bridge the average toll per truck increased 12 percent.

In thousands of cases the installation of Toledo Scales **has reduced complicated, troublesome, and unusual measurement problems to a simple weighing operation, and protected a variety of interests by the oldest and most accurate method of measurement—the balancing of weight against weight.**

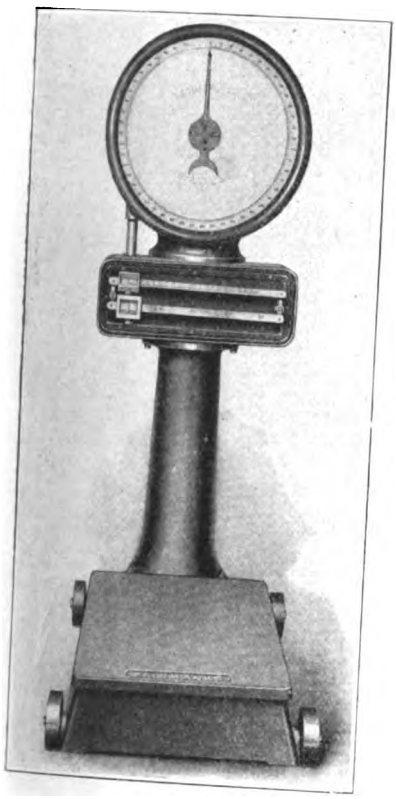
Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.
Manufacturers of Automatic Scales for Every Purpose
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TOLEDO SCALES
NO SPRINGS HONEST WEIGHT

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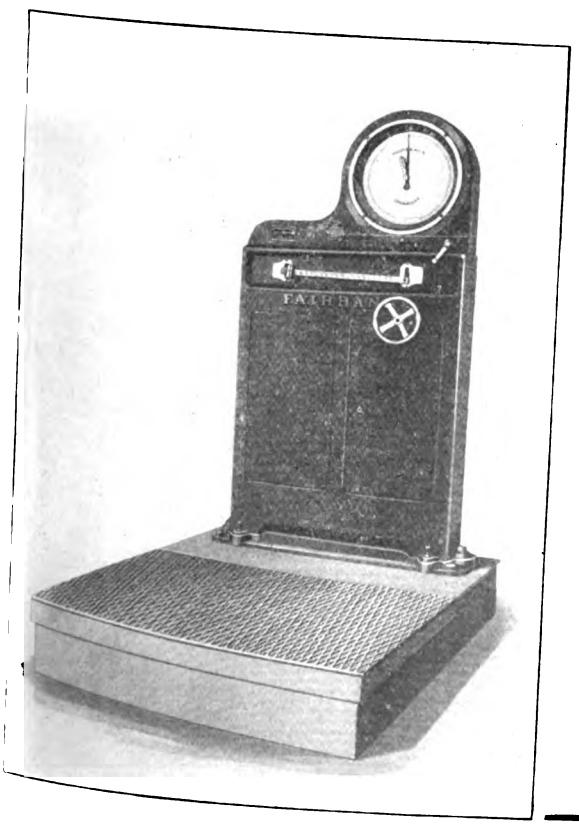
FAIRBANKS SCALES



The features of Fairbanks Scales embody 90 years of scale making. They are serving every industry by giving accurate and reliable weights of raw and finished products.



For Economical Weighing



In handling materials it is absolutely essential that weighing be done with speed and yet with accuracy.

For quantity weighing the advantages of the Fairbanks Dial Scale have been demonstrated by the numerous installations in warehouses, shipping rooms, freight houses, packing plants, foundries, steel mills, sugar refineries, paper mills and many other commercial and industrial departments.

The nearest office can give you full details.

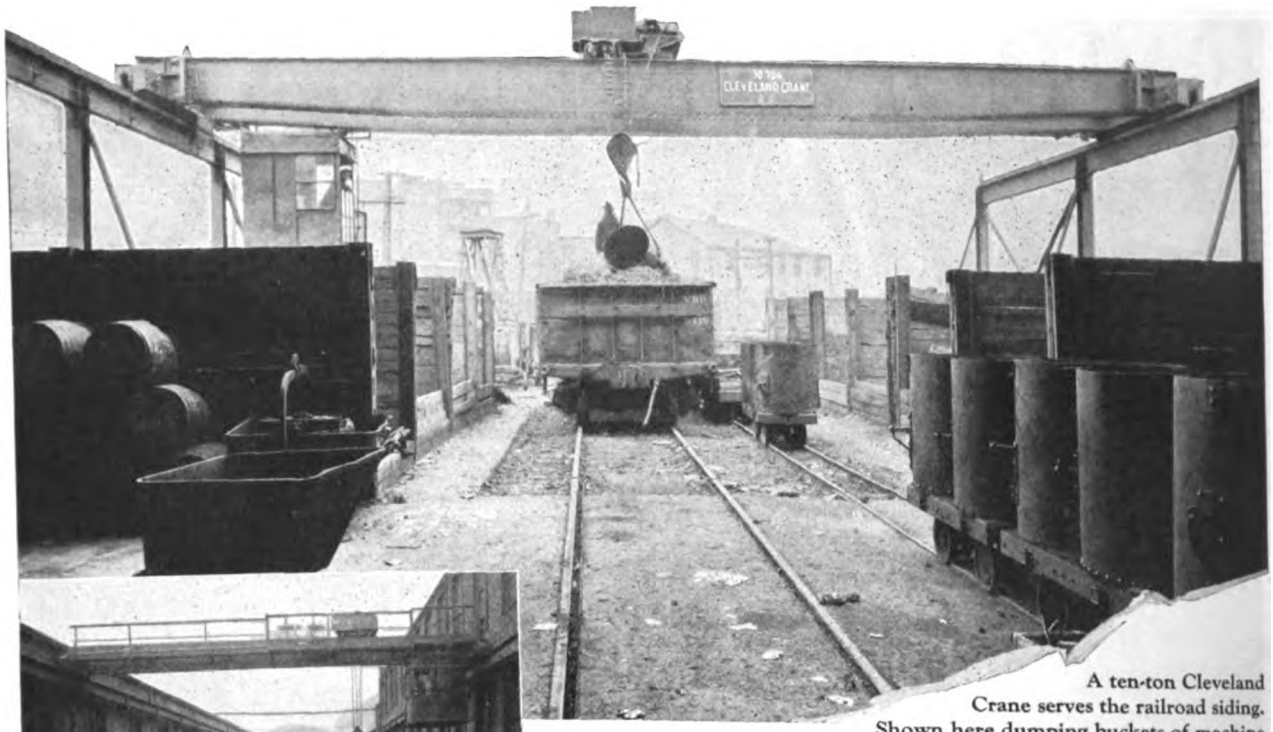
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900 South Wabash Ave.

And 40 other principal cities—each with a service station

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A ten-ton Cleveland Crane serves the railroad siding. Shown here dumping buckets of machine shop scrap into a freight car.



Heavy castings stored near the machine shop—handled by a five-ton Cleveland Crane.

EACH of these CLEVELAND CRANES plays an important part in the "Money Saving" material handling system now operating in the East Pittsburgh plant of the Westinghouse Electric and Manufacturing Co.

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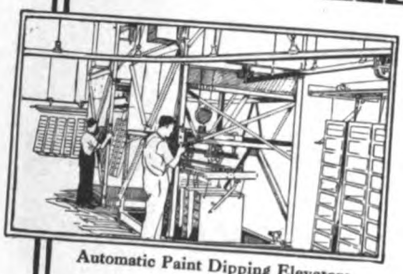
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

CLEVELAND CRANES

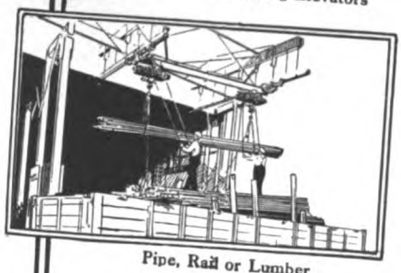
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CLEVELAND HAND OR ELECTRIC TRAMRAIL



Automatic Paint Dipping Elevators



Pipe, Rail or Lumber

Out goes the home-made I-beam system

A modern Cleveland Electric Tramrail system has replaced an obsolete, worn out I-beam, trolley and drop-cord hoist in the plant shown below. There were several good reasons for the change.

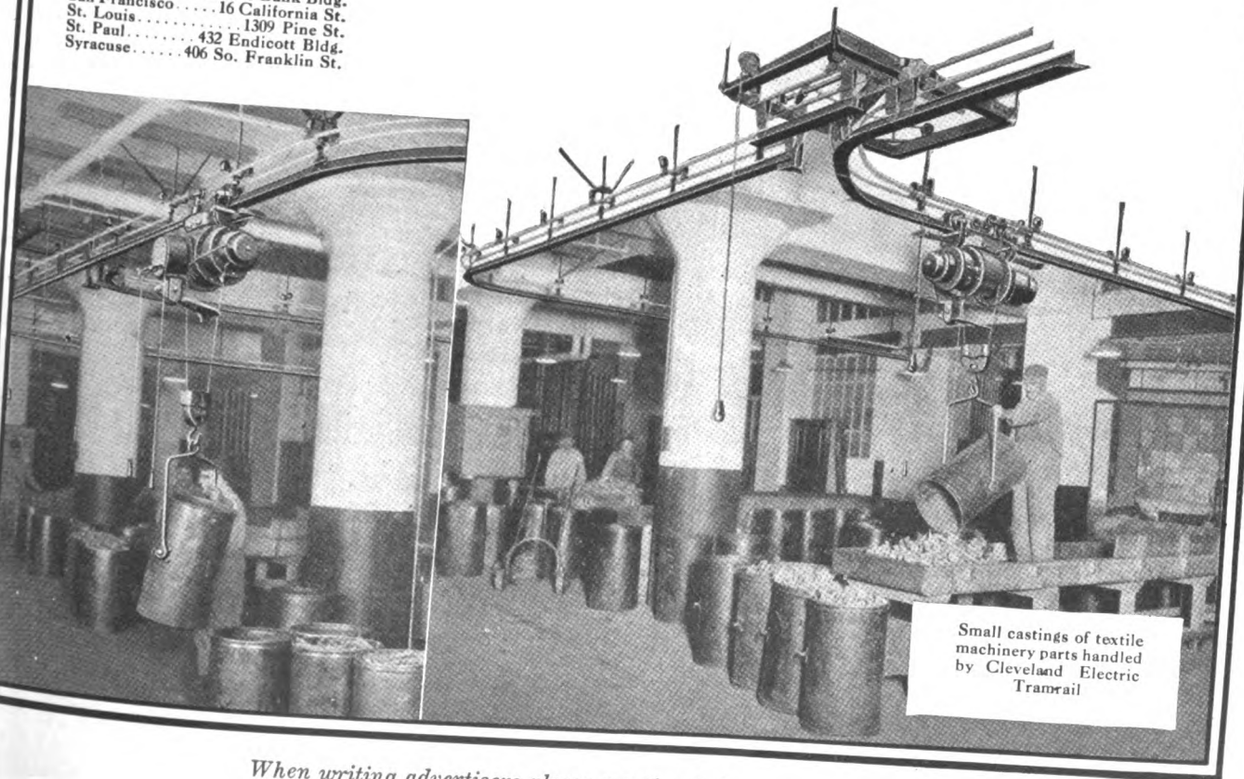
1. A hard, steel rail is cheaper than iron when wear and frequent renewal are considered.
3. Ball bearing carriers running on a smooth steel rail reduce travel time for load *and workmen*.
3. Rigid, well insulated conductor bars make it possible to operate the hoist anywhere—without "plugging in" to the wiring system.
4. Easy operating Tramrail switches make every aisle and bench in the plant accessible.

When considering overhead handling equipment, write for our complete catalogue. It pictures hundreds of Cleveland Tramrail systems now in operation.

Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

Tramrail Stocks in the Following Cities:

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Boston	44 Bromfield St.
Buffalo	1507 Hertel Ave.
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Chicago	80 E. Jackson Blvd.
Denver	1226 E. 17th Ave.
Detroit	149 E. Larned St.
Los Angeles	430 E. Third St.
Louisville	36th and Missouri Sts.
Newark	1023 Broad St.
New York	30 Church St.
Philadelphia	2401 Chestnut St.
Pittsburgh	511 Farmer's Bank Bldg.
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St. Louis	1309 Pine St.
St. Paul	432 Endicott Bldg.
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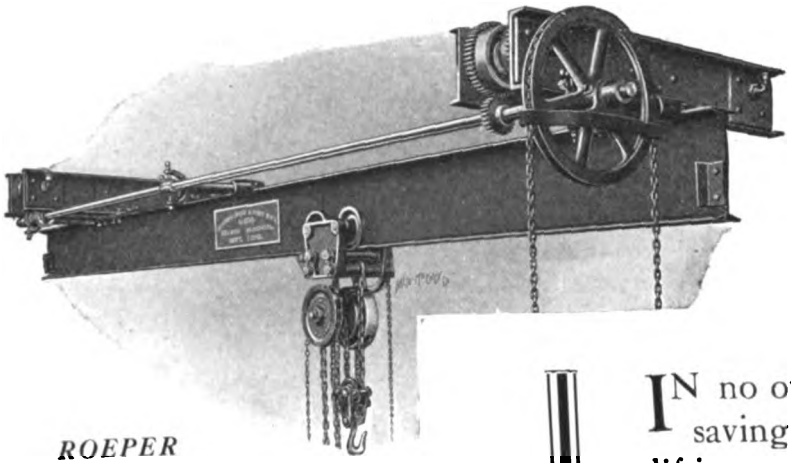


Small castings of textile machinery parts handled by Cleveland Electric Tramrail

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ROEPER

Traveling Cranes **Electric Hoists** **Trolleys**



ROEPER
Standard Geared
Suspended Crane

Materials Handling Equipment - - -

IN no other form of handling is labor saving more apparent than in the lifting and moving of raw materials and finished products through the agency of hand or electric hoists and traveling cranes. The ROEPER line of materials handling accessories is fundamentally designed to save minutes and manpower, both large factors in overhead costs, thereby effecting economies and increasing both production and profits.

The ROEPER line includes electric traveling cranes up to 10 ton capacity; electric hoists with hand or motor driven trolleys, for either floor or cage operation; hand power traveling cranes up to 30-ton capacity and 60-foot span; I-beam trolleys, switches and turntables. Concentration of Roeper production efforts means speed of delivery and service impossible in the case of larger capacity plants.

We shall be pleased to send literature descriptive of any or all of our products.



Hoisting material to second floor



Type "R" Hoist

ROEPER CRANE & HOIST WORKS
1728 N. 10th Street READING, PA., U. S. A.

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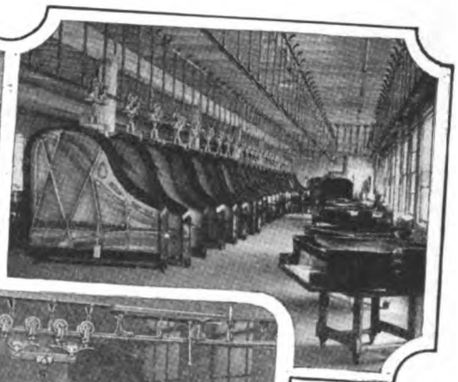
(Above) Setting 1700 lb. motor quickly, easily, safely. Monorail can be routed over machines and heavy parts spotted on them. Allis-Chalmers Mfg. Co., Milwaukee, Wis.



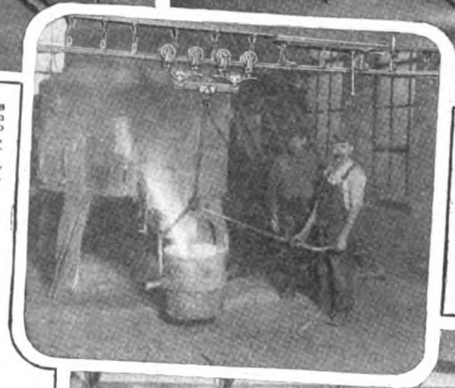
(To right) Beautiful, lustrous, fragile chinaware—handled on Louden Monorail. Finished ware being taken from inspection room to stock department. Pottery of Lenox, Inc., Trenton, N. J.



(Above) Conveying 20 shawls of window glass from splitting shed to flattening ovens, quickly, with no danger of breaking. American Window Glass Co., Pittsburgh, Pa.



(Above) Saves time and handling in varnishing. Storage tracks save space and rehandling between coats. Costs cut 1-3. Apollo Piano Co. De Kalb, Ill.



(To left) From furnace to moulds over Louden Monorail with one-third the gang. Less than $5.00 in 2 years for maintenance. Burd High Compression Ring Co., Rockford, Ill.

"Louden Monorail Saves Us $5,000 a Year"

This is reported by the Griess-Pfleger Tanning Co., Waukegan, Ill.—and scores of other plants, in many widely varied lines of production, likewise give credit for large savings to Louden Monorail as against old methods of man-handling material.

In practically every line of industry, where loads up to 2000 lbs. must be moved, you can profit by using

LOUDEN
OVERHEAD CARRYING EQUIPMENT

In large plants and in small ones this active material handling equipment which is so moderate in cost, has proved itself to be one of the greatest of all production economies—a saver of labor, time, floor space, floor wear, rehandling expense and breakage. "We save $1544 a year with our Louden Monorail System, or 100% on the investment," reports the H. R. Mallinson & Co., Inc., Astoria, L. I. "It reduced our pouring gang from 20 to 6 men," is the word from the International Motor Co., New Brunswick, N. J. And the Martin-Parry Corporation says that "Louden Monorail used at York, Indianapolis, Lumberton, and in 18 or 20 of our branches is saving us, roughly, $8,000 to $10,000 a year." These reports are typical of many others in our files.

You should see one of these amazingly active Louden Systems at work to thoroughly appreciate how it can and does reduce production costs. Smooth-running trolleys on a strong, safe track with sturdily built switches that are quickly and accurately operated, keep production humming and sing a song of savings that will surely warm your heart.

Let us refer you to an installation in your vicinity or advise one of our nearby Engineers to call and go over your plant for the purpose of making a report to you. Without obligation, of course. Set a date to suit your convenience.

Send for Louden Overhead Book

It pictures many installations in various industries—from a few feet of track to many miles. Tells an interesting story of how other concerns have cut production costs. Send for your copy.

THE LOUDEN MACHINERY COMPANY

588 West Ave. Established 1867 Fairfield, Iowa

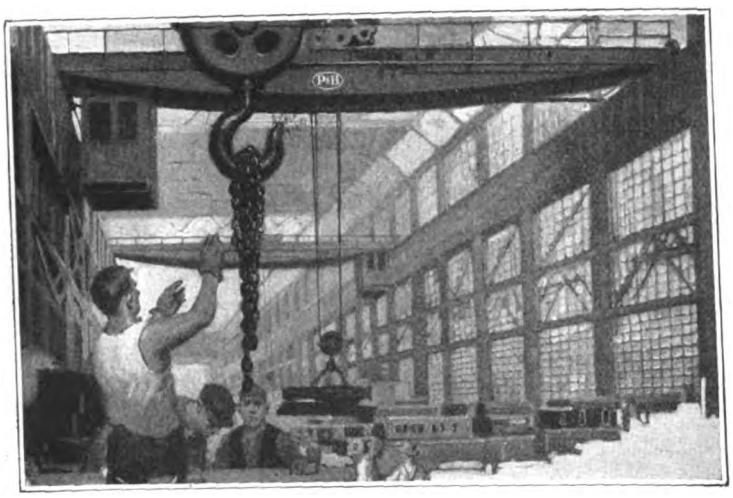
Branches in Principal Cities



Several miles of Louden monorail in one of the biggest motor plants in the country. It is used in continuous operation handling raw materials, parts finished and complete products from supply to machines, from machine to machine, and finally to warehouse or shipping platform. This installation has made possible increased quantity, speedier work and a lessened cost of production.



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Service to Industry

BACK of all the 40 years of activities of the Harnischfeger Corporation is one idea—to give the user of P & H electric traveling cranes and hoists, material handling service unexcelled in performance and cost figures over many years of operation.

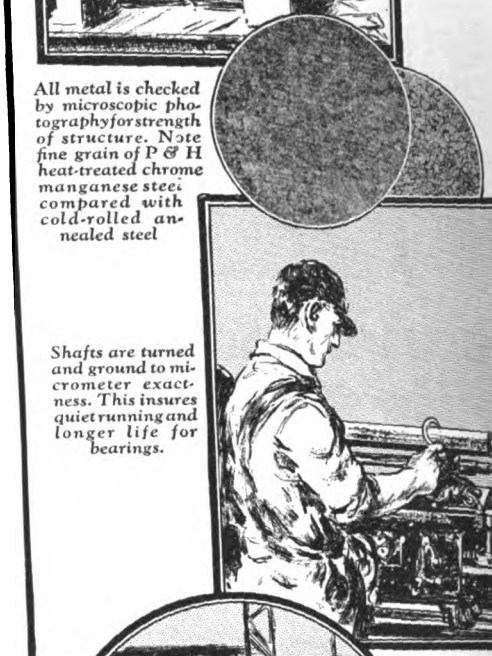
The P & H organization is necessarily large and to insure the satisfactory and profitable service of its products it has undertaken many tasks that involved additional responsibilities.

Chemical and metallurgical tests of all materials are made; electric steel castings are produced in our own foundry; all steel plates are re-rolled to make doubly sure of proper alignment and eliminate even the slightest strains; every necessary modern machine is found in the 28 acre daylight plant; and P & H workmanship and service is traditional.

In fact, there is much in every P & H Crane and Hoist that does not appear in the specifications—much that means better service, longer life, unusual overload capacity and lower maintenance. Experienced factory executives recognize the economy of the P & H.



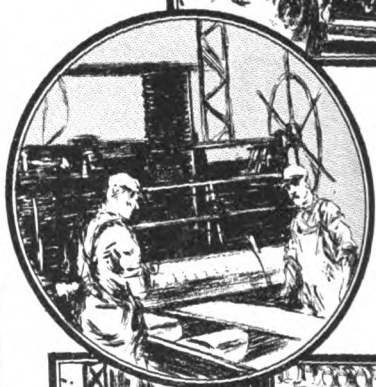
All metals for P & H equipment are carefully checked continually in our modern physical and chemical laboratories.



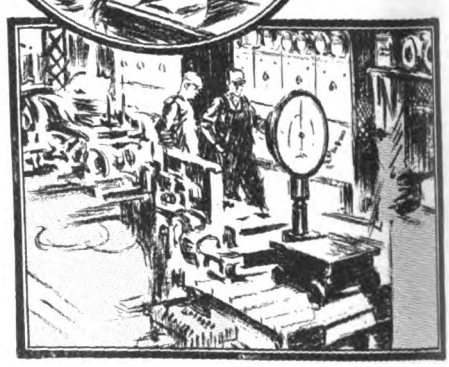
All metal is checked by microscopic photography for strength of structure. Note fine grain of P & H heat-treated chrome manganese steel compared with cold-rolled annealed steel



Shafts are turned and ground to micrometer exactness. This insures quiet running and longer life for bearings.



All steel plates for bridge girders are re-rolled in a special machine to remove kinks, bends and scale. The slightest strain is eliminated and perfect alignment made certain.



Electrical Testing Department where every motor is given a speed torque, overload, insulation puncture and megohm resistance test. All motors used are built entirely in the P & H plant.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
CRANE AND HOIST DIVISION
Established in 1884
3850 National Ave., Milwaukee, Wis.

New York, Philadelphia, Dallas, Jacksonville, Birmingham, Pittsburgh, San Francisco, Kansas City, Detroit, Minneapolis, Chicago, Portland, Memphis, Los Angeles, Seattle

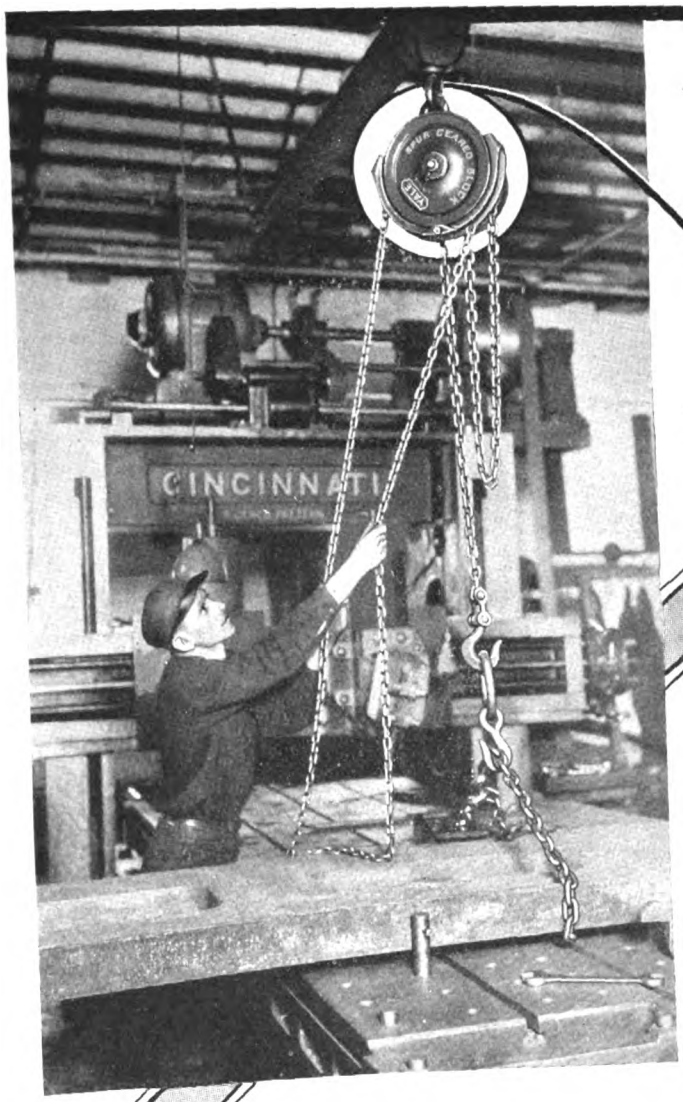
P&H CRANES and HOISTS

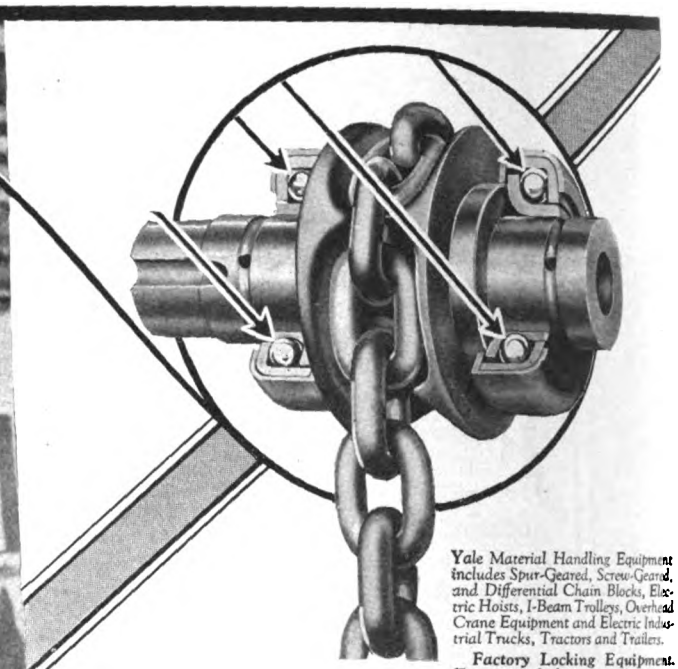
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TRADE **YALE** MARK





Yale Material Handling Equipment includes Spur-Geared, Screw-Geared, and Differential Chain Blocks, Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment. To acquire locking control, security and convenience throughout the factory use Yale Master Keyed Locks.

The Chain Block of highest efficiency

A seventy-seven pound pull lifts a ton with a Yale Block.

It's a one-man, one-hand job.

The load sheave in a Yale Spur-Geared Chain Block rotates on large chrome-vanadium steel ball bearings.

This is the latest exclusively Yale development in a long list of improvements in chain block construction that have revolutionized hand hoisting during the past 51 years. *Yale is the original hoist and Yale has been the originator of every notable improvement.*

The one-ton Yale Block here pictured is a permanent part of the heavy planer equipment. One man easily handles the side-frame castings weighing a ton to a ton-and-a-half, and places them on the bed plate in position for the work. Yale is the standard—for efficiency, long life, speed and safety.

The Yale & Towne Manufacturing Co.
Stamford, Conn., U. S. A.

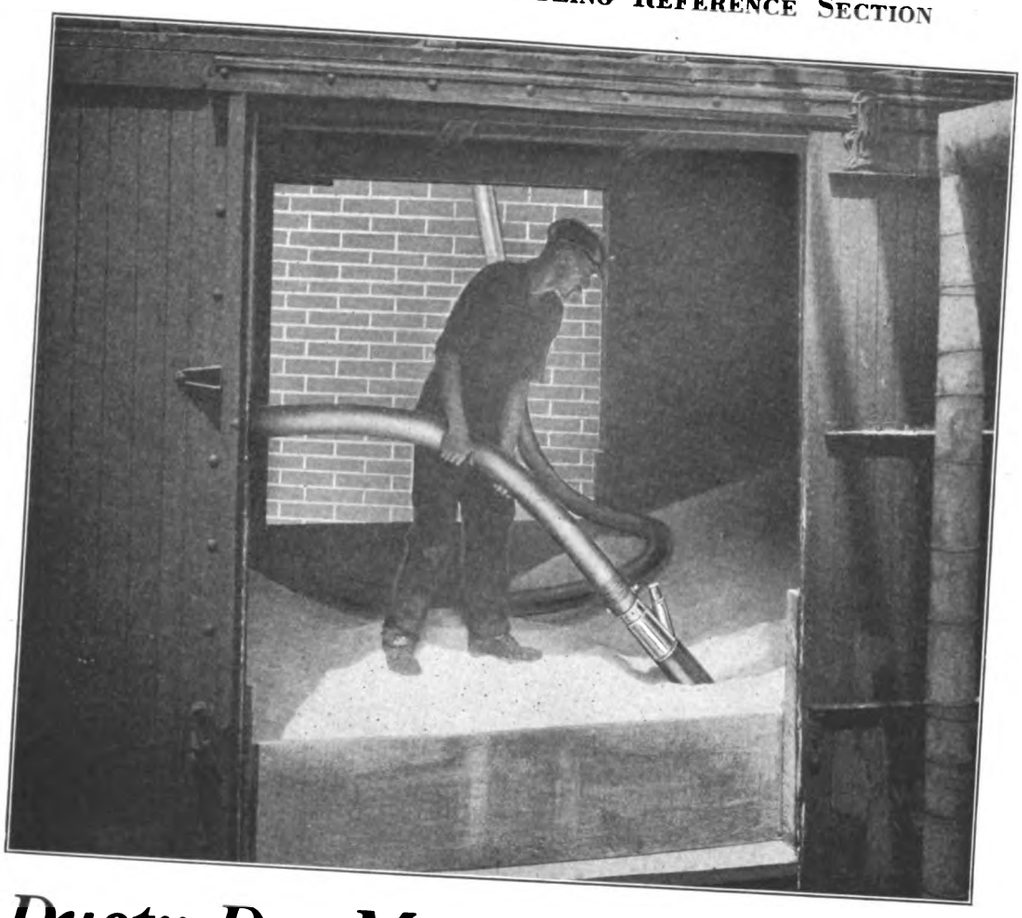
YALE MADE IS YALE MARKED

TRADE YALE MARK

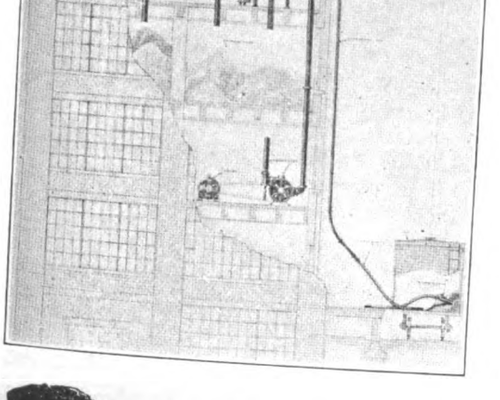
Hoisting and Conveying Systems

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Fine, Dusty, Dry Materials in Every Industry Are Now Conveyed Pneumatically by DRACCO Systems



Where fine, dusty materials that contain particles injurious to men and equipment are to be conveyed, the ordinary methods of transporting are very inadequate.

The many DRACCO System installations that are now in successful operation, conveying pneumatically poisonous, unpleasant, hard to handle materials, prove that these were the only logical solutions to the problems presented.

DRACCO SYSTEMS besides saving labor costs, conserve the health of workers and save and convey every particle of the materials, no matter how fine. They are in use for transporting lead oxide, lime or phosphate rock, fertilizer, powdered clay and many other similar products.

Our engineers are ready to assist you with your conveying problem. Their experience covers years of contact with Dust Collecting, Pneumatic Conveying and Fume Recovery. The installations on the following pages show some of the results of their efforts.

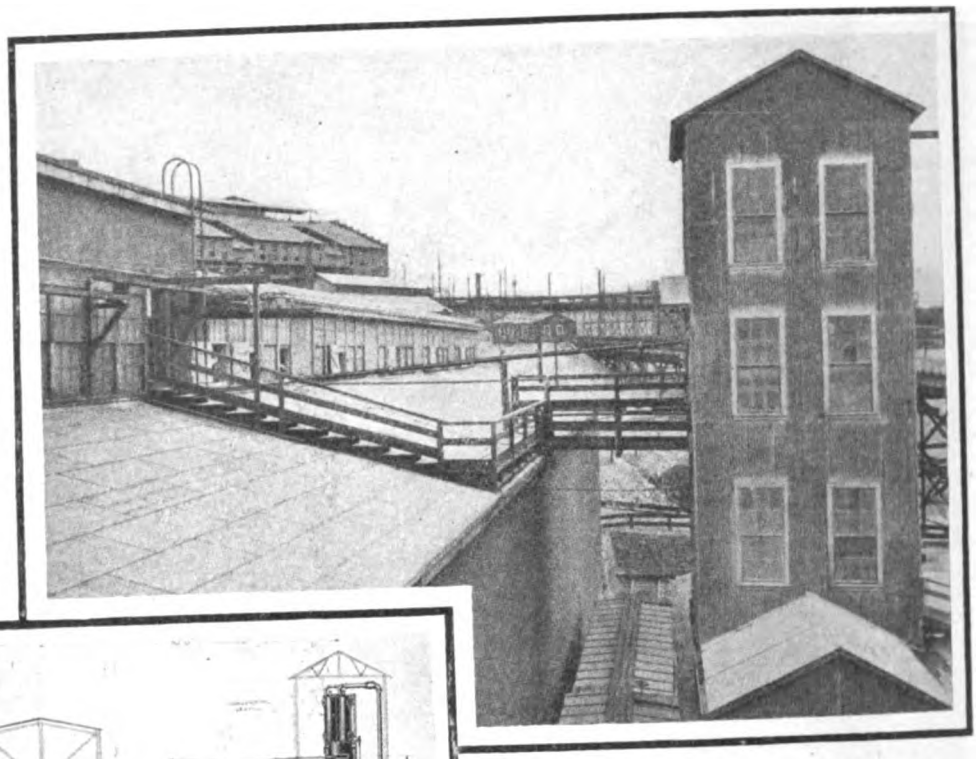
DRACCO DOES IT

THE DUST RECOVERING & CONVEYING CO.

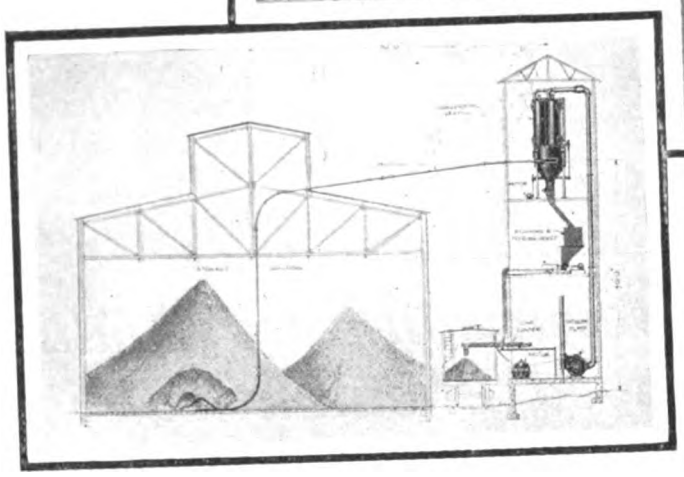
Engineers and Manufacturers, Cleveland, Ohio.

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Photograph Showing Conveying Pipe from Storage Building to Collector



A Difficult ... Solved by a ...

The Experience of DRACCO Engineers in Pneumatic Conveying Covers Some of the Largest and Most Efficient Installations in Industry

DRACCO Performance based on DRACCO Design and Engineering Efficiency is shown in these illustrations.

They actually represent two installations, where finely ground, treble phosphate from storage is conveyed pneumatically at the rate of 10 tons per hour. These DRACCO Systems were so designed that they can discharge either direct to cars, when they are loaded in bulk or through a second spout to packers.

There, only a DRACCO Pneumatic System could solve the problem. That of conveying a dry, fine material, weighing 50 pounds per cubic foot, yet of a sticky nature with a tendency to pack.

Dust Collection
Fume Recovery

DRACCO
THE DUST RECOVERING
Engineers & Manufacturers

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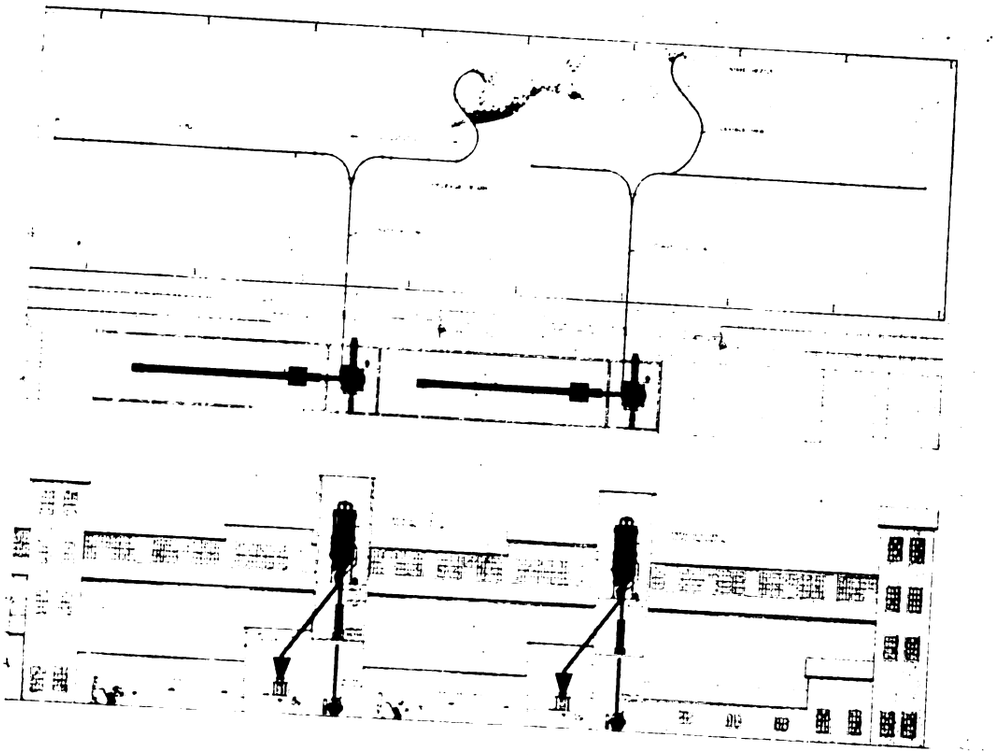


Fig. 4—Plan View and Side Elevation of Dracco Installation, Storage and Packing Houses

Problem of Handling Materials
"DRACCO" Pneumatic Conveying System

Installations such as these in different industries show the comprehensive experience of DRACCO Engineers. Such a wide variety of materials is now being successfully conveyed pneumatically by DRACCO Systems that your own problems are—to DRACCO Engineers—not new, but referable to problems already solved.

Your own problem can be no more difficult than those here worked out successfully. In this case the product is exceedingly harmful to workers—irritating to the skin, nose and throat. The labor problem on this account alone was a difficult. DRACCO completely eliminated this by the clean conditions which resulted.

DRACCO Systems in addition, recover every particle of the materials; not a grain lost in transit.

We have a number of bulletins describing in detail various DRACCO Installations. We will gladly mail you one of special interest to you

SYSTEM
& CONVEYING CO.
Cleveland, Ohio. U.S.A.

Pneumatic
Conveying

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Pneumatic Conveying

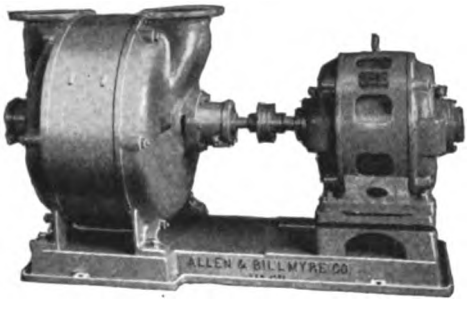
of Dust and fine Particles offers the Most Economical and Efficient Way

In many manufacturing plants the removal and collection of dust, lint, etc., from floors, walls and machinery constitutes a problem of great importance. Dust causes industrial losses of millions of dollars each year, in fires, explosions, damage to plant, product and equipment and injury to health of workers. Some dusts are sufficiently valuable to justify reclamation.

Tabco Pneumatic Sweeping Systems in many different kinds of industrial plants are solving many difficult problems. Tabco Systems are made both in the *Stationary* and *Portable* Types and especially designed for industrial service. Each installation is given individual attention.

Tabco Pneumatic Systems are designed and installed to meet individual requirements. They are installed in industrial plants throughout the United States and in many foreign countries. Among recent purchasers are

New York Edison Co.—New York
United Electric Light & Power Co.—New York
Interborough Rapid Transit Co.—New York
Virginian Railways Co.—Va.
Providence Gas Co.—R. I.
Portage Coal Mining Co.—Pa.
Public Service Electric Co.—Colo.
Willard Storage Battery Co.—Ohio
Texas Power & Light Co.—Texas



TABCO TRADE MARK

Centrifugal Compressors and Exhausters

"One Working Part—No Wearing Parts"

The machines are unique in their design and construction. In addition to their being used with Tabco Sweeping and Conveying Systems, they are rapidly being adopted for many other classes of industrial service, such as for use with Oil Burning Systems, Pneumatic Tube Systems, for Aeration and Agitation of Liquids, Gas Pressure Boosting, Gas Circulation Systems, etc.

Send for Bulletin mentioning proposed application and required capacity if possible.

Allen & Billmyre Co., Inc.

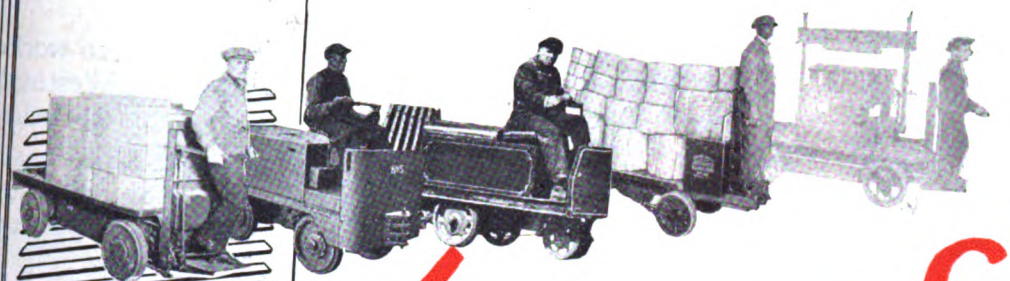
Pneumatic Engineers and Manufacturers

726 Grand Central Palace, New York

TABCO PNEUMATIC SWEEPING AND CONVEYING SYSTEMS

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4 out of 5 are Edison Equipped

Edison Storage Batteries reduce the low cost of electric industrial trucking.

Five of the plants featured editorially in this issue of "Industry Illustrated," use industrial trucks for intra-plant service.

Four out of the five use Edison Batteries.

This is an overwhelming testimonial to a quality product.

Edison Batteries are higher in first cost than any other battery *—but their cost per year and per ton-mile is less.* This is what counts.

Edison Batteries are different from all others—different in principle, in design and materials. Their sturdy *steel* construction assures six, seven or more years of useful life, low maintenance and dependable service.

These four leading manufacturers, and hundreds of others, have proved this point. Ask us to send the evidence.

EDISON STORAGE BATTERY COMPANY

Orange, N. J., U. S. A.

Edison

STEEL-ALKALINE

Truck Batteries



Built like a Watch — Rugged as a battleship

HAUL MORE FOR LESS MONEY

ATLANTA BOSTON BUFFALO CHICAGO CLEVELAND DETROIT HUNTINGTON LOS ANGELES NEW ORLEANS NEW YORK PHILADELPHIA PITTSBURGH SAN FRANCISCO SEATTLE ST. LOUIS WASHINGTON

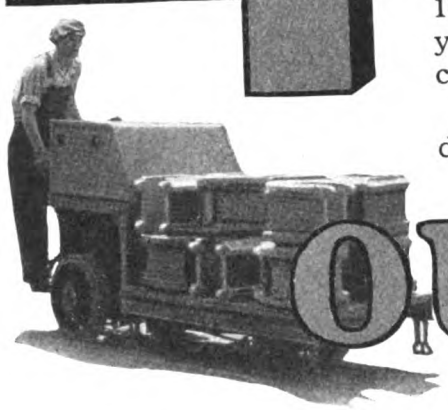
Export: 26 West Broadway, New York

Canadian Distributors: International Equipment Co., Montreal, Quebec

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FOUR OUT OF SIX PLANTS USE ELWELL-PARKER TRUCTORS

4



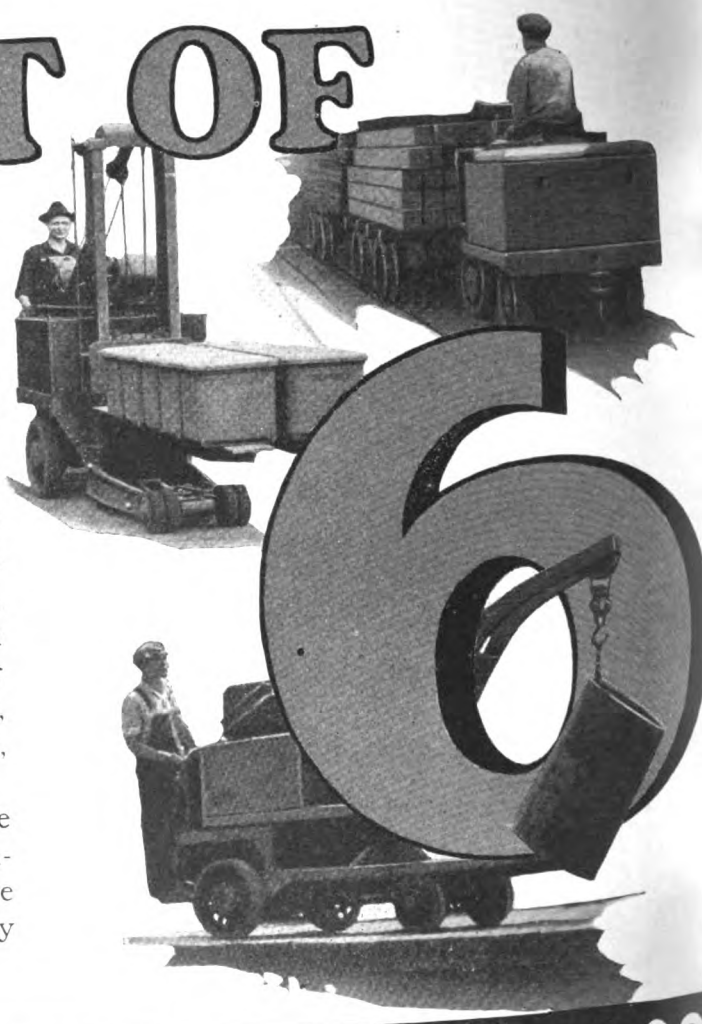
One hundred and two Elwell-Parker Tructors have worked for years handling hundreds of thousands of tons for Westinghouse, Brown & Sharpe, Chapman Valve Mfg. Co., and one other.

The first Westinghouse unit, installed in 1912, has saved its cost again and again, and it is still "at it." Westinghouse fleets, each succeeding unit better than the last, are well earned tributes to Elwell-Parker quality. No one yet knows how long Elwell-Parker Tructors will last!

There is still time to save the cost of at least one unit before 1926. The wages of the many men it saves will quickly pay for your Tructor. From then on this sum will go into your profit column.

A request from you will bring information bearing on the reduction of material handling costs in your plant.

OUT OF



6

Or, if you wish, we'll send a copy of our new 1925 catalog. It tells how Westinghouse and the others find Elwell-Parker Tructors indispensable. It tells what loads they carry, size of load platform, capacities and lengths of booms on portable stacking cranes, how high an elevator tructor will pile, how steep a ramp these battery-driven equipments will climb, whether the tractor type will move a freight car, how they steer on all four wheels, how much floor space they save, how soon they will pay for themselves, what others have saved.

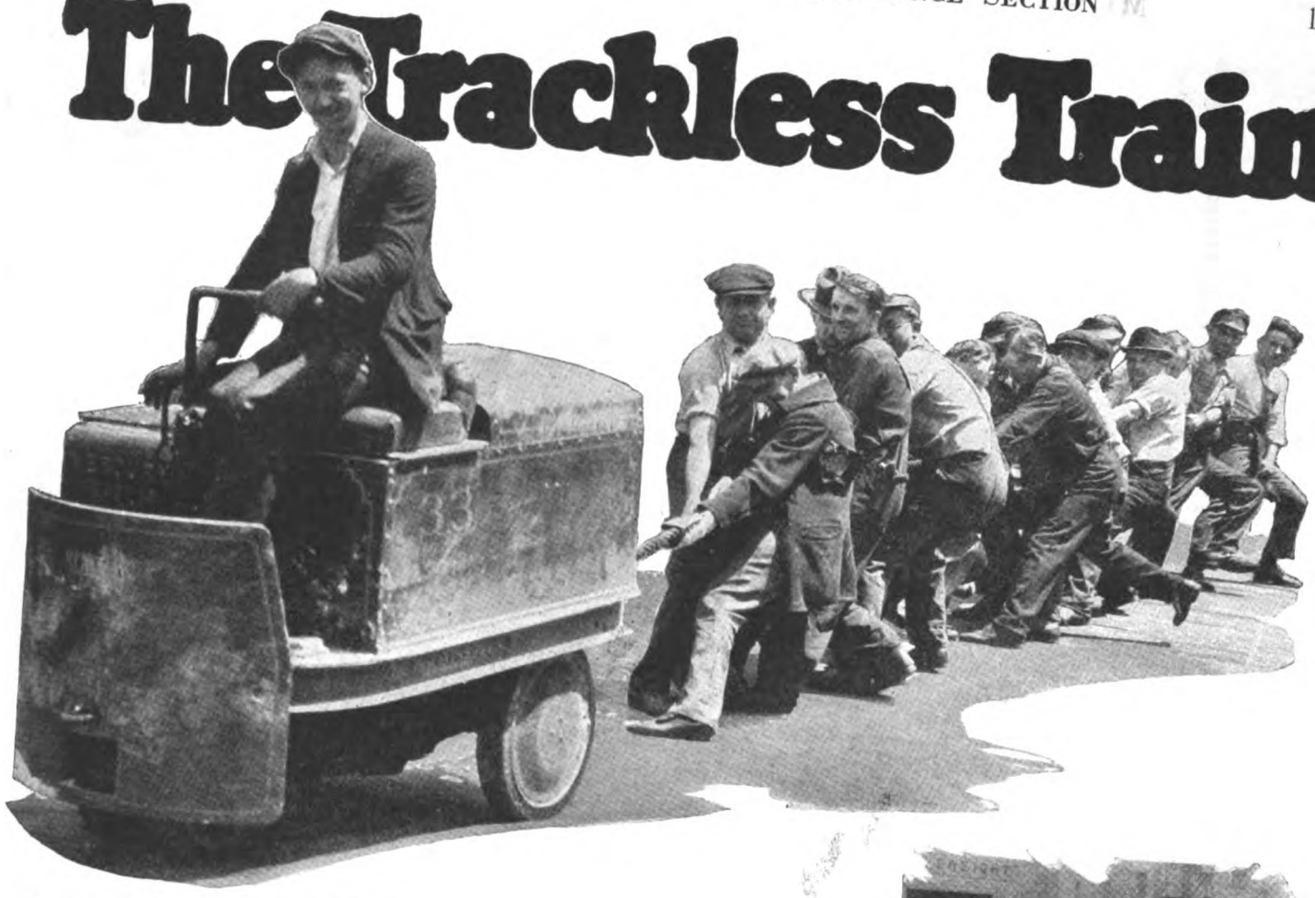
These and many other questions are answered in this 40-page illustrated catalog, a copy of which you should have handy. Someone in your organization may ask you about them any day.

THE ELWELL-PARKER ELECTRIC CO.
CLEVELAND

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The Trackless Train



14 MEN—

and a boy

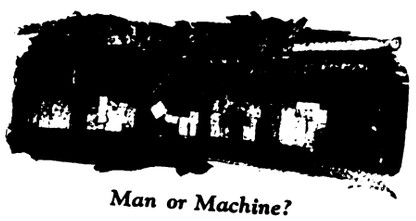
To decide a bet, the other day, we held a "tug of war." *A boy—weighing 135 pounds—pulled 14 men—averaging 170 pounds each—literally "all over the place."* Of course the boy was ably assisted by a Mercury Tractor. As a matter of fact twice 14 men—and more—would have unsuccessfully pitted their muscular strength against the steel and wire sinews of the machine.

Yes!—it is true. Confined within the narrow limits of the tractor frame is the "ability to work" equal to that of 30 husky men. Ready to leap into action at the hand of a boy on the controller. To pull—to push—to tug—in a word *to work* where and when there is work to be done.

The things one of these machines can do are astonishing. *Mercury builds fifteen different models.* There is one to fit the job that is puzzling you.

Why not call in a Mercury Engineer for consultation?





Man or Machine?





Economy-vs-Waste

Mercury Manufacturing Company

4112 So. Halsted St. Chicago

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RE-ORDER



Now Four K models
for Dodge Manufacturing Corporation

Here is another gigantic concern that appreciates good machinery and buys Stuebing products. Following briefly are the reasons why they prefer this K Model Stuebing to other types.

1—60 to 1 lifting power.
2—Lifts from any point of the compass.
3—High lift—load movable at any point of elevation.
4—Safety—handle cannot fly up to cause injury.
5—Timken Thrust and Hyatt Bearings assure easy steering and rolling.
6—Lifting mechanism enclosed and operates in lubricant—insures long life—aids easy lift.
7—Durability—all steel construction, including steel wheels. Strength with lightness. All parts machined — standardization — interchangeability.

You likewise would find this K Model far superior. We gladly welcome demonstrations. Write.

THE STUEBING TRUCK COMPANY Cincinnati, Ohio



Stuebing Steel-Bound Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble

StueBing

LIFT TRUCK SYSTEMS

When writing advertisers please mention Industry Illustrated

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Over 12,000 Firms Use Cowan Lift Trucks and Skids

Actual Service counts, not clever "talking points"

"REDUCE the cost of your material handling!"

That is the only possible reason you have for buying lift trucks and skids. That is also the only purpose for which we want to sell them.

Who cares about clever "talking points," details or novelties of construction that have no effect upon the final cost of your material handling? Cowan, to be sure, welcomes the most searching tests of every part of its hand and electric lift trucks and skids. The three concerns mentioned at the left did just that—and, consequently, are large Cowan users today.

But the point is that Cowan equipment is not put together by the sales department with an eye merely on easier conversational opportunities for our salesmen.

Cowan is concerned entirely with what our equipment will actually do in your plant, year after year, in reducing handling costs—in efficient operation and in low maintenance cost.

Note. Every part of every Cowan product is interchangeable from one end to the other. From a mechanical angle it is scientifically engineered for the work it is to do.

Note. Cowan trucks and skids are all-purpose units. They are suitable for 95% of all conditions where they can be used at all. But where special designs are necessary, Cowan is equipped to apply the best of engineering skill and specialized experience to the problem.

Note. Cowan is the original manufacturer of lift trucks. It has been in the business for 14 years. It has the largest number of customers and the largest current output. Is it any wonder that when break-down and operation tests are made the value of this experience is clearly revealed? It would be more surprising if Cowan equipment did not justify its leadership.

We suggest merely that you use the coupon below as a convenient way of securing complete data on Cowan equipment. And that Cowan be given consideration whenever the problem of reducing material handling costs comes up for discussion.

COWAN LIFT TRUCK CO.
41 Water St. Holyoke, Mass.



Send for Free Book

Profitable Service:

(See the text in this issue)

Leading Textile Machinery Company

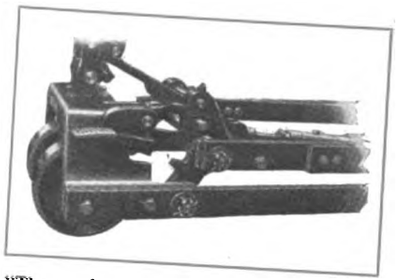
These people thoroughly tested many makes of electric trucks as to efficiency in operation, costs of up-keep, etc. Several Cowan Trucks are in daily use. The last two trucks purchased are Cowan. Many Cowan skids are used also.

Chapman Valve Co., Indian Orchard, Mass.

Use both hand and electric Cowan Trucks. They write: "The service you have been giving us has been very excellent—we consider your trucks among the topnotchers—we do not hesitate to say that your latest truck is a very nice piece of equipment."

Brown & Sharpe Co., Providence, R. I.

Use Cowan Hand trucks and skids — over 250 Cowan skids. Cowan skids have been exclusively standardized upon after thorough breakdown and service tests of every kind of skid available.

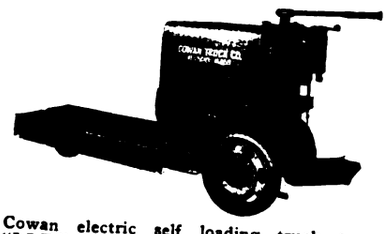


"The result is maximum handling efficiency, minimum operating expense, longer life, faster and cheaper movement of your materials."

Type "G" hand lift truck during lifting action shown above. Rugged, compact construction. Positive action. Mechanically efficient leverage and lifting principle.



Cowan long life skid and type "G" hand lift truck. Units of the Cowan System that cut handling costs 40% to 60% and give perfect service.



Cowan electric self loading truck type "LLT." For efficient use as lift truck and tractor.



COWAN LIFT TRUCK CO.
40 Water St., Holyoke, Mass.

Please send me your free booklet "'Saving from 40% to 60% in Handling Costs," and bulletins checked
( ) Hand Lift Trucks
( ) Electric Trucks
( ) Skids

Name .....

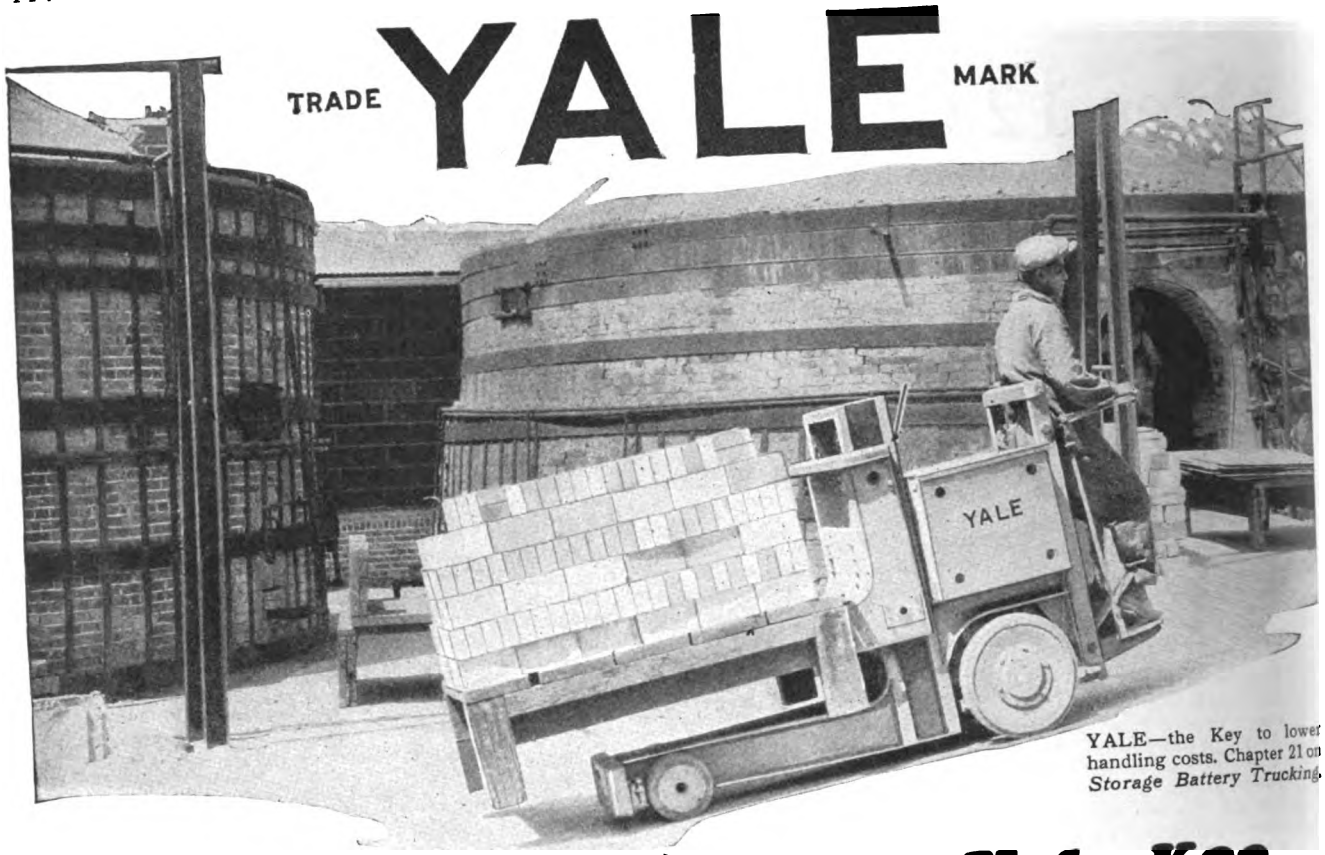
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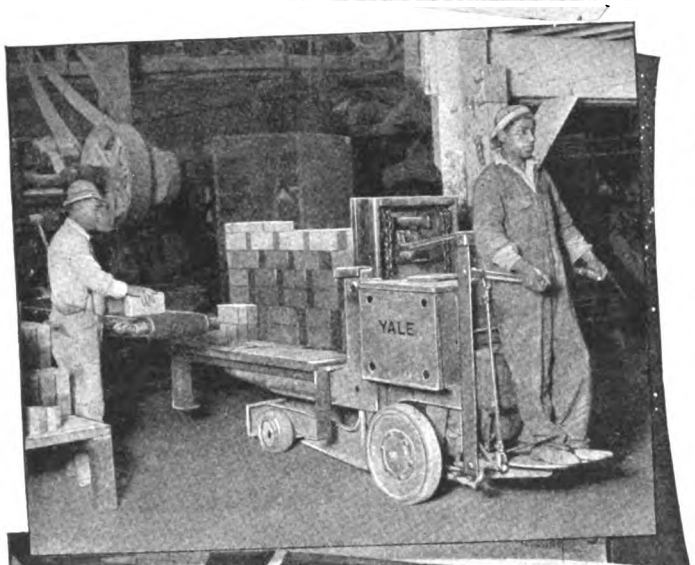
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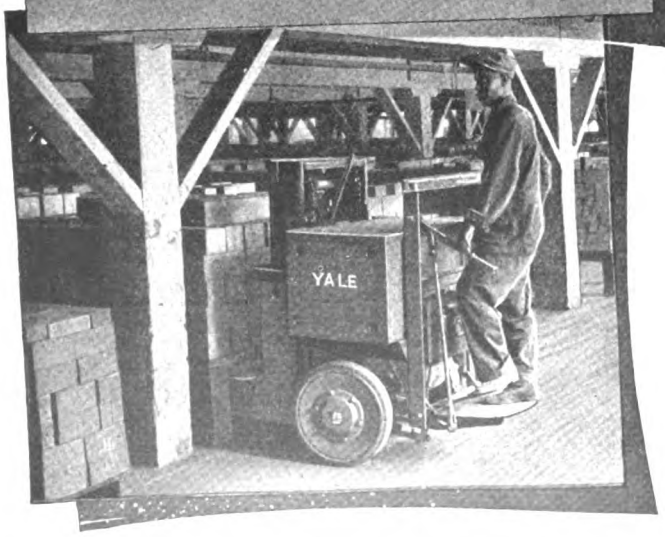
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YALE—the Key to lower handling costs. Chapter 21 on *Storage Battery Trucking*.





One Yale K22 handles 137,500 bricks in a day

This was an unusual "rush job," but it shows what a Yale Elevating Platform Truck *can* do in handling bricks under emergency conditions.

And Electric Trucks were not regarded as at all practicable in this plant of the Pacific Clay Products Company until a Yale K22 was demonstrated.

The demonstration opened up such interesting possibilities that one truck was immediately ordered and placed in operation. Two months later another Yale K22 was installed and these trucks are now regularly handling the entire plant output. Each truck averages 30,000 or more bricks per day.

The saving amounts to 72 man-hours per day.

Yale Storage Battery Trucks and Tractors are profitable. Every new installation represents its own peculiar problem, yet in practically every industry Yale intraplant trucking has saved its installation cost in the first year of operation.

The Yale & Towne Mfg. Co.
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Hoisting and Conveying Systems

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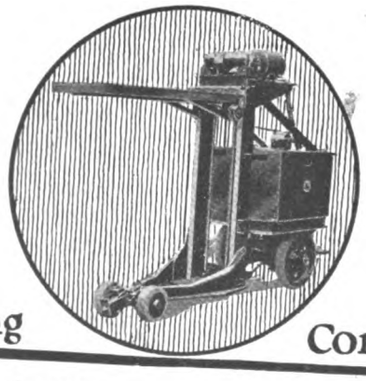
Lakewood Electric Trucks and Skids Save Money in all Industries

Illustration shows Lakewood equipment handling hides in one of the largest and most modern plants in the United States.

If you are modernizing your handling methods or building new plants, submit your handling problems to Lakewood engineers.

Manufacturers of Tier-Lift trucks, tractors, trailers and narrow gauge railway equipment.

Send for Snap Shots of Sensible Savings.



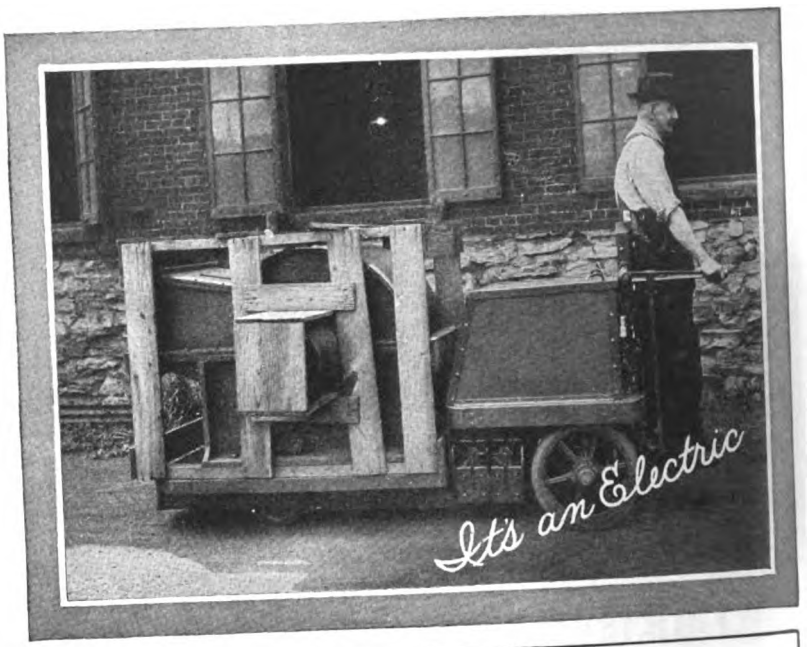
The Lakewood Engineering Company, Cleveland U.S.A.

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The Second Step

to *really* low handling costs

You first trimmed down the toll of handling materials and work-in-process by putting electric industrial trucks on the job. Now you can lop off more expense by putting a really economical source of power in the trucks.





PLANT managers who handle materials with capable electric trucks and tractors have taken the first step toward rock-bottom handling expense.

Many have gone one step further in their search for cost-cutting handling equipment. They have pounded down expenses still lower by studying the essential qualities of storage batteries.

IN the battery box of the electric industrial truck or tractor lies the opportunity to make a second worth-while cut in handling costs. Plant managers everywhere have tested different types of storage batteries. They have let their cost sheets be the judge. Many of these far-sighted men have standardized on the Exide-Ironclad Battery.

The economy of the Exide-Ironclad Battery can be proved by simple arithmetic, thus: First cost + Cost of repairs and recharging ÷ Number of months in service = Actual battery cost per month.

First cost of the Exide-Ironclad Battery is reasonable. Because of its rugged, rough-and-ready construction it rarely needs repairs or replacements. Its internal resistance is low, its watt hour efficiency is high—hence it wastes very little current—a minimum of kilowatt hours is required to charge it fully—current costs are low. It stays on the job month after month, for years.

And that isn't all

With these convincing low-cost features the Exide-Ironclad Battery combines the essential qualities for effective operation.

Reserve Power. This battery is a mighty reservoir of power. In easy, level going it delivers ample current economically. With any sudden need for extra power comes a surging flood of energy, up to many times its normal rate.

Sustained Speed. It provides all the speed you need—for the first run in the morning, for the *last* run in the afternoon.

And *that* isn't all. Why not get *all* the interesting facts on the second step to really low delivery costs? They are all clearly proved in the interesting booklet, "Facts for Consideration in *Selecting a Battery* for Electric Industrial Truck and Tractor Service." A post card brings this booklet, Form 1874, to you, free of obligation. Send for it today.

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IRONCLAD
BATTERIES

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For Every Material Handling Requirement

SMALL, compact, powerful—with structural advantages possessed by no other industrial machine, and equipped with special Baker built motor exactly suited to its task—Baker standard and special tractors, trucks and cranes operate at higher overload over a longer period than any other industrial motor vehicle.

THE BAKER R & L COMPANY
CLEVELAND, OHIO



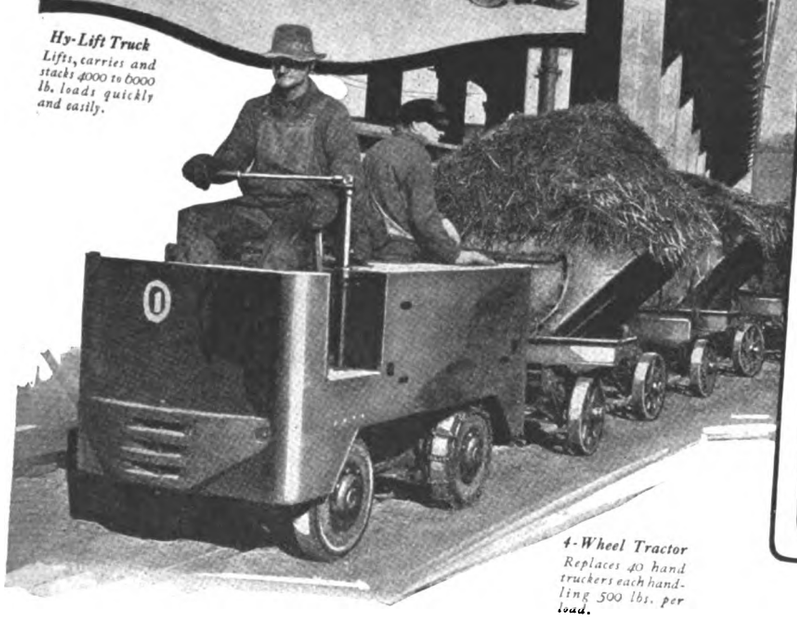
Elevating Truck
The most versatile of material handling equipment. Works readily in narrow aisles and congested spaces.



Hy-Lift Truck
Lifts, carries and stacks 4000 to 6000 lb. loads quickly and easily.



Locomotive Crane
Combines the major advantages of both truck and crane.



4-Wheel Tractor
Replaces 40 hand truckers each handling 500 lbs. per load.

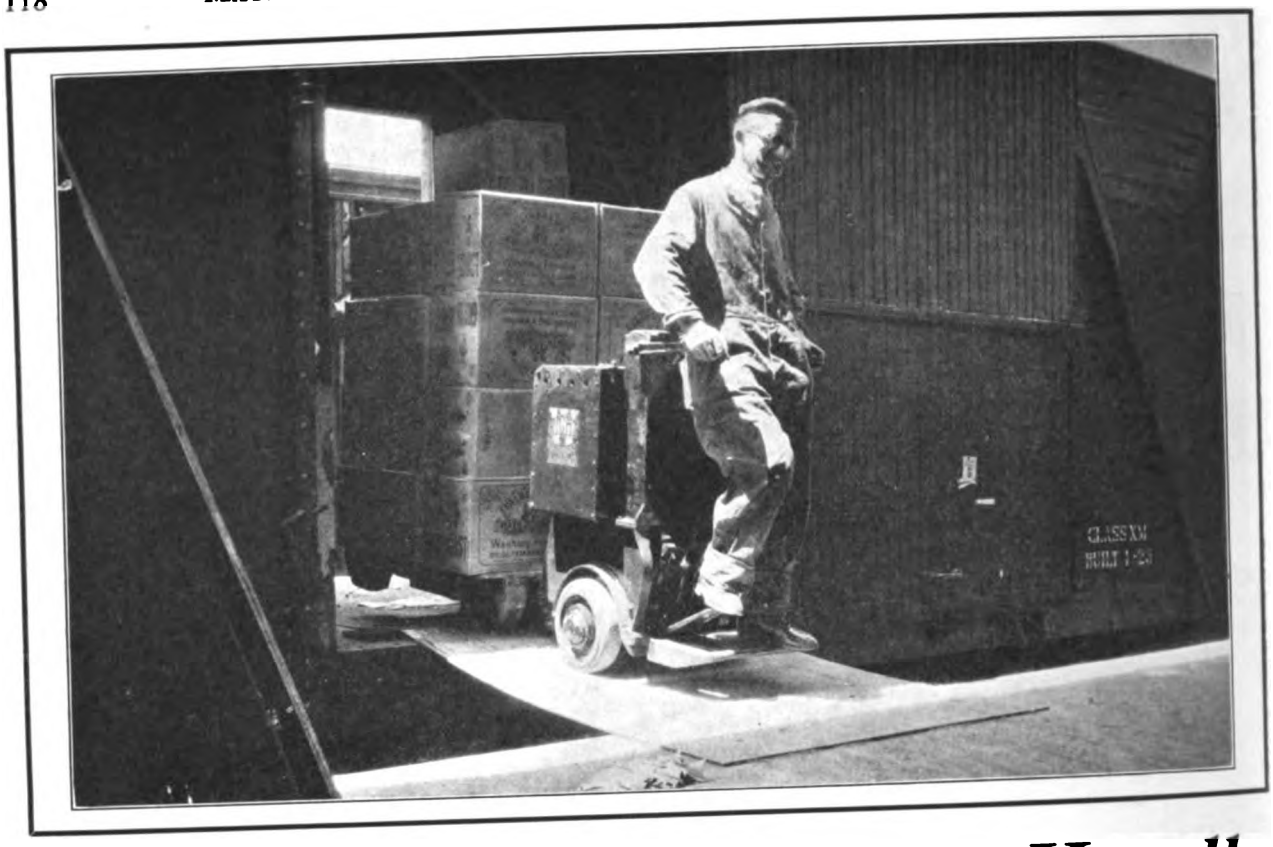
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As Easy to Handle as a Hand Lift Truck

When you put a Wright Electric to work in your plant, your present hand lift platforms can be utilized.

The great flexibility of operation is remarkable. It will go anywhere that a hand lift goes. But it also handles the larger platforms just as easily. And only one motor is used for both lifting and propelling.

The Wright is easily manoeuvered around the shortest turns. Its exceedingly short turning radius (5 feet outwheel) makes the Wright accessible around the sharpest turns and on through the narrowest aisles.

You will find a Wright to meet every condition with fourteen sizes to choose from.

Write for complete details and descriptive literature.

WRIGHT TRUCK

WRIGHT-HIBBARD
INDUSTRIAL ELECTRIC TRUCK CO.

***Main Office and Factory,* PHELPS, N. Y., U.S.A.**

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A real for sure "nuf" working model

is yours for the asking—just mail the coupon—the postman will place it on your desk

Here's something real—it works—right before your eyes and shows why there is no overhead obstruction that can stall the work of "The Telescoper."

It shows how "The Telescoper" can work under low beams, pipes, and balconies—or pass thru low doorways and onto elevators—all without adjustment or "hinging over the top"—and in the next instant elevate its platform to work to the ceiling.

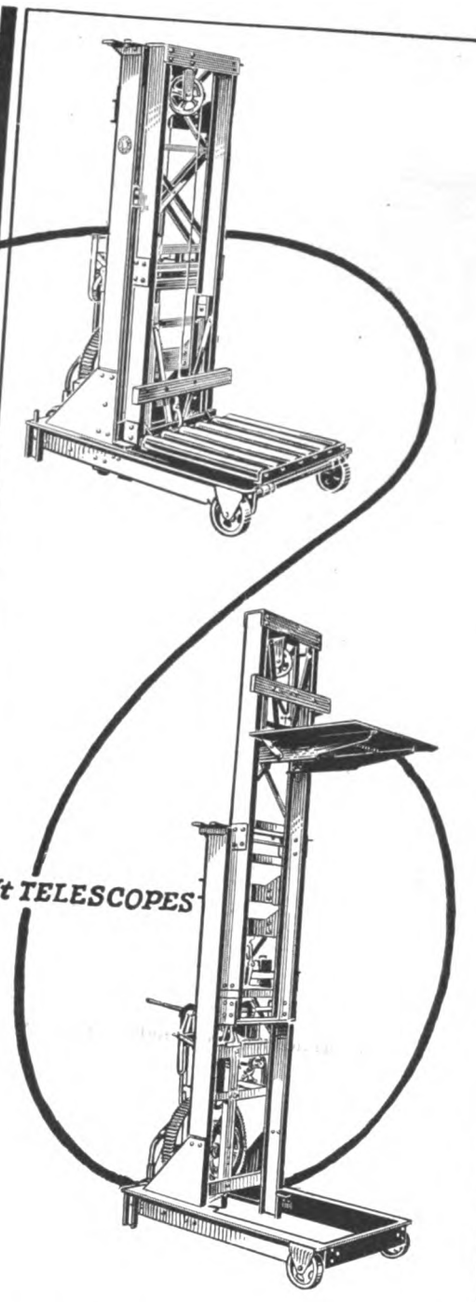
It tells a story better than Webster's whole dictionary—it doesn't cost you a nickel but its worth many dollars—for it shows how to save money.

Just clip the coupon—send it today for ***your working model.***

Economy Engineering Company

2663 W. Van Buren St., Chicago

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The Telescoper is built in many capacities, sizes and kind of power—all to suit your requirements.

for stacking—tiering or piling

ECONOMY LIFTERS

for every lifting requirement

—yes it's free

Economy Engineering Co. 2663 W. Van Buren St., Chicago

"I want to see how it works—send the model."

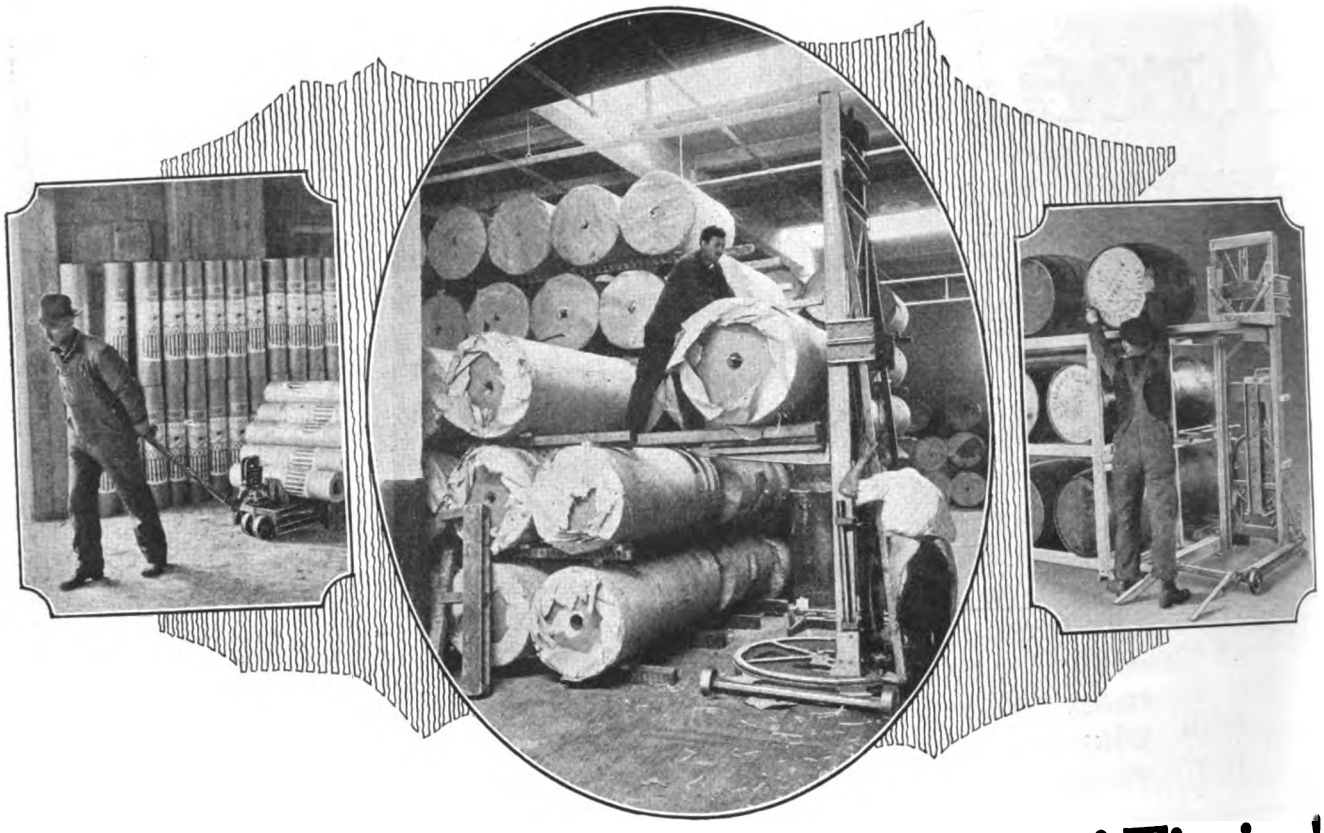
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Hauling! Lifting! Storing! Stacking! Tiering!

Revolvator furnishes a complete *unbaised* cost-cutting service

The Revolvator, a portable elevator for piling or stacking heavy, bulky packages or articles such as bales, crates, boxes, rolls, bundles, barrels, hogsheads, etc. The Revolvator is the only portable elevator made with a revolving base so that the machine can be used in narrow aisles or confined spaces. The Revolvator is made in nine standard models, for hand operation, electric motor drive or a combination hand or motor operation to suit any piling proposition.

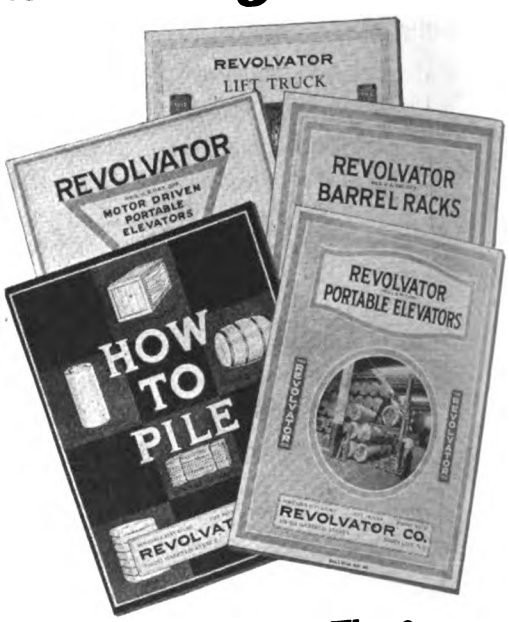
Who Uses the Revolvator

General Motors Co.....46	General Electric Co.....35
Ford Motors Co.....41	National Biscuit Co.....34
E. I. DuPont De Nemours Co.....36	Western Electric Co.....21
Standard Oil Co.....36	Imperial Oil Co.....20
National Aniline & Chemical Co.....35	Endicott-Johnson Co.....19
	U. S. Rubber Co.....17
	Robert Gair Co.....17

Here are twelve of the largest companies in the country using 357 Revolvators. There are many small concerns who find their Revolvators invaluable.

Revolvator Barrel Racks are of all steel construction made to meet your requirements and afford an economical method of storing barrels in a secure and orderly manner.

Revolvator Liftrucks are of steel construction and will elevate from either side as well as from the front. They are equipped with a number of special safety features that make them the ideal Liftruck.



REVOLVATOR CO.

Revolvators, Portable Elevators, Lifters, Pilers, Stackers, Tiering Machines, Liftrucks, Barrel Racks.

322 Garfield Avenue Jersey City, N. J.

Write for These Free Booklets

Write for your copy of any or all of the Revolvator Bulletins. You will receive from these bulletins, which have just been issued by us clear, concise information on Revolvator material handling equipment. If you are handling material you need the Revolvator Bulletins to keep up to date. Send for these bulletins—now—to-day.

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?

"When *will* somebody make a truck wheel that rolls easily and silently without ruining floors?"



We have!--and it answers every trucking question

Never before has there been a truck wheel that would do all these things

Q. *Are Ruboids silent?*
A. Their rubber tread sees to that. Silent as rubber-tired wheels, but they wear longer.

Q. *Are Ruboids easy on floors?*
A. Actual abrasion tests show Ruboids cannot wear out floors—they roll so smoothly, take the bumps so easily.

Q. *Do Ruboids roll easily?*
A. Look at the Ruboid wheel—such construction means easy traction over any floor.

Q. *Will Ruboids wear well?*
A. Actual tests show they outwear any wheel except noisy metal. And they wear evenly, which other wheels seldom do.

Q. *Will Ruboids take the load?*
A. Yes, sir! They'll take any load any other wheel will—take it over rough floors or smooth ones, without a whimper.

Q. *Do Ruboids cost more?*
A. No, sir! They cost less, in fact. And they save in labor, floor repairing costs, and quickened transportation.

There never has been such a satisfactory truck caster wheel as Bassick Ruboids. *New* in idea, *new* in construction, *new* in materials used—*new* in the service they give—the way they last.

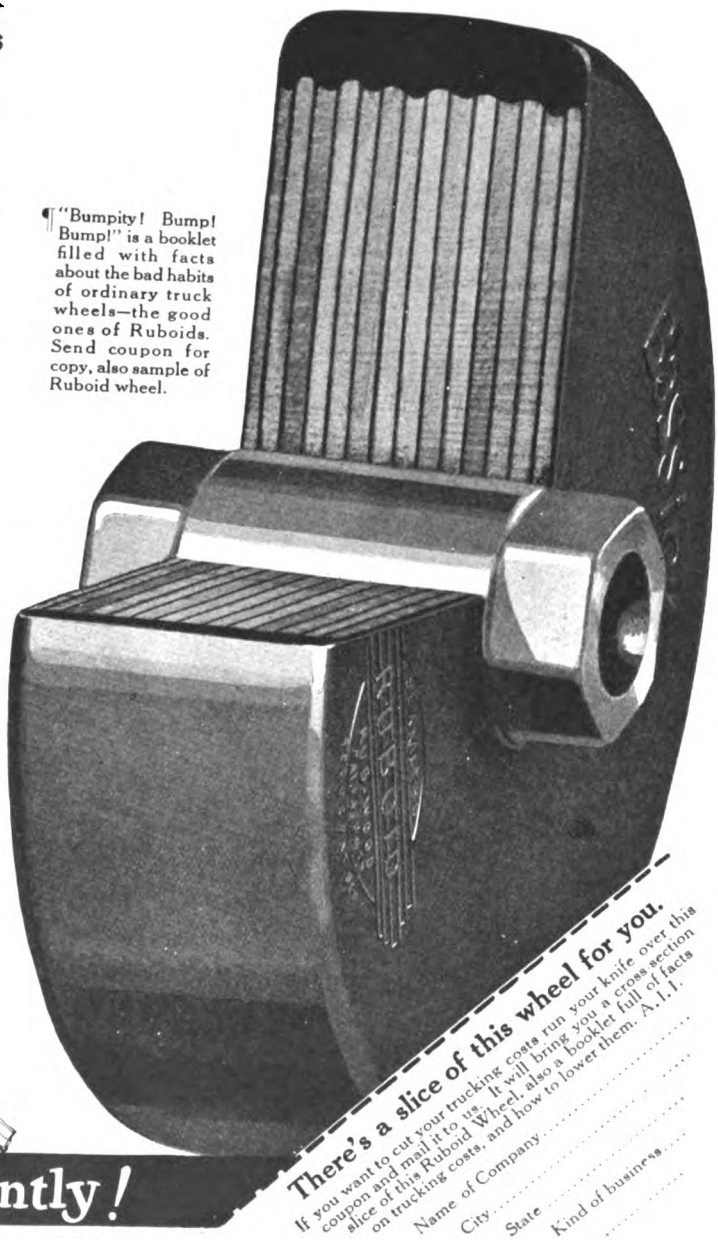
THE BASSICK COMPANY, Bridgeport, Conn.

Bassick

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SEAMLESS RUBOID RUB-WOOD PAT. 1458 379 REG. U.S. PAT. OFF.

¶ "Bumpity! Bump! Bump!" is a booklet filled with facts about the bad habits of ordinary truck wheels—the good ones of Ruboids. Send coupon for copy, also sample of Ruboid wheel.



There's a slice of this wheel for you.

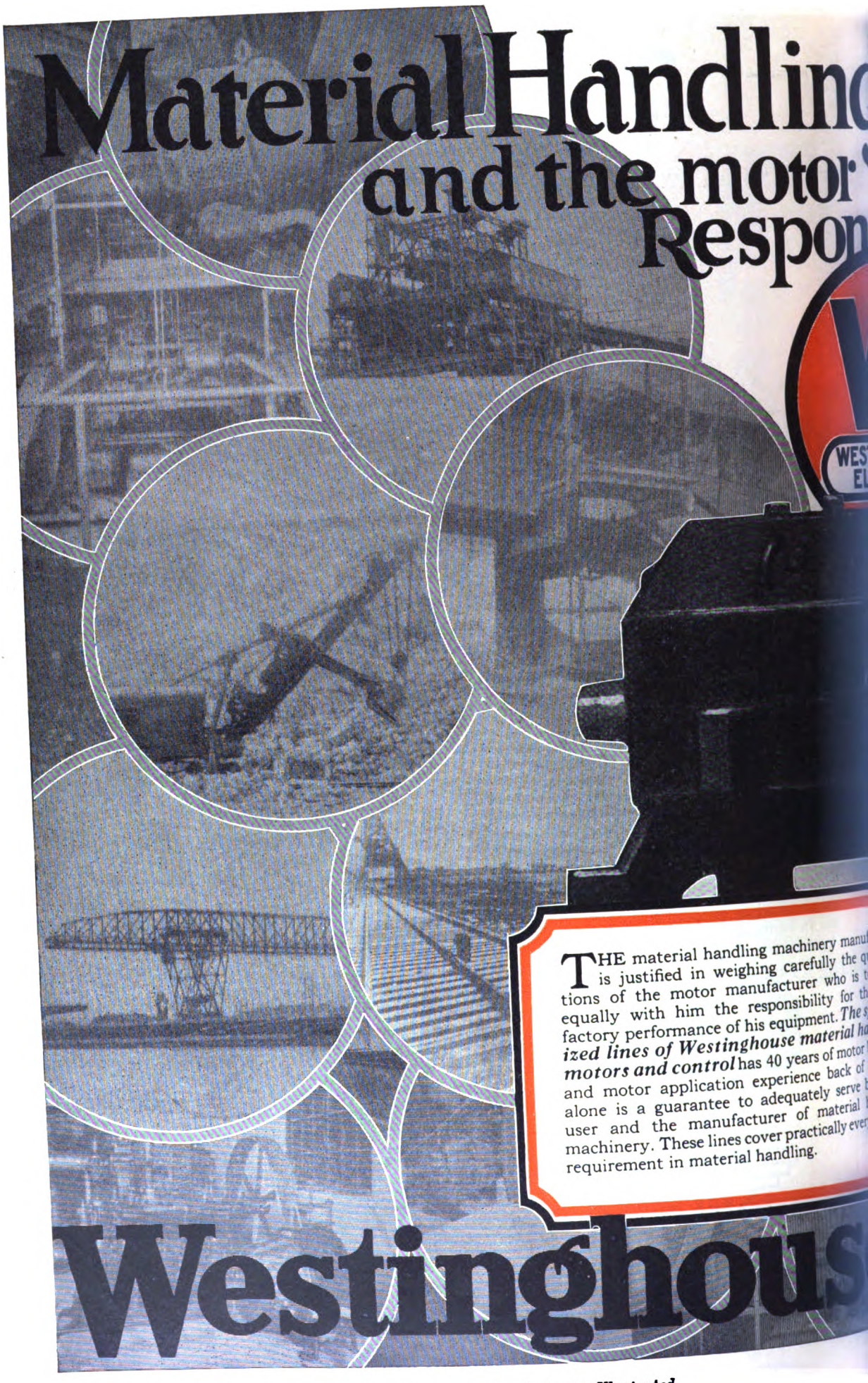
If you want to cut your trucking costs run your knife over this coupon and mail it to us. It will bring you a cross section slice of this Ruboid Wheel, also a booklet full of facts on trucking costs, and how to lower them. A. I. I.

Name of Company .....
City ..... State ..... Kind of business .....



Ruboids Roll Easily—Silently!

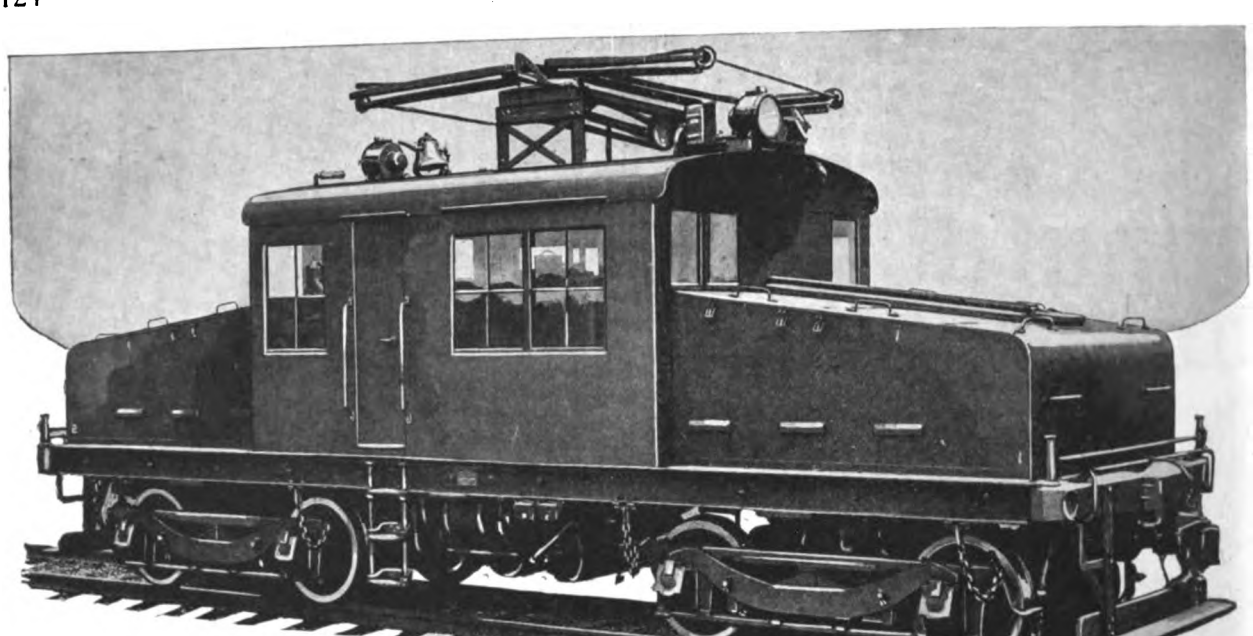
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75-Ton Combination Storage Battery and Trolley Locomotive



Combination Platform and Haulage Storage Battery Locomotive

Complete Service for Industrial Haulage

Whether the demand be for switching service, for inter-factory handling of material, or for the carting away of ashes and refuse, there is a G-E Locomotive capable of doing the job most economically.

G-E Locomotives are made in a wide range of sizes. Power may be obtained from storage battery, trolley, third rail or combination of storage battery and trolley.

Responsibility for their manufacture is undivided. Every step from the cutting of the frame plates to the track-test run is under General Electric control.

The haulage problems in General Electric's various plants have been great. But these are only a few of the many that G-E engineers have solved in the last 30 years.

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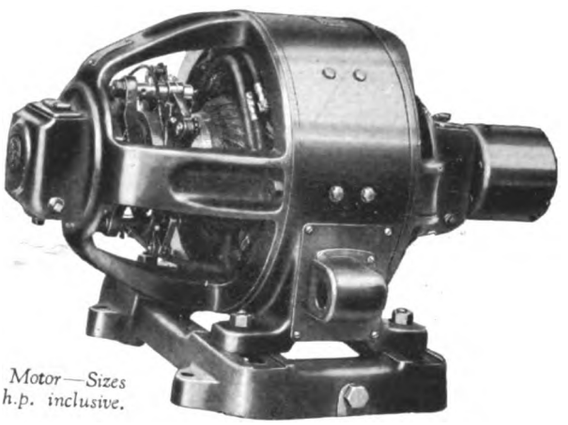
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Announcing

TWO NEW DIRECT-CURRENT MOTORS



Type BD Motor—Sizes ½ to 3 h.p. inclusive.



Type CD Motor—Sizes 3 to 200 h.p. inclusive.

FOUR-SQUARE superiority in an electric motor demands a combination of certain indispensable factors: adequate research facilities—high grade designing ability—liberal manufacturing resources—extensive practical experience.

Combination of these factors in General Electric's new Type BD and Type CD Motors marks a distinctive kind of craftsmanship—*balanced excellence* in the design and manufacture of direct-current motors.

To obtain full value from your investments in direct-current motors, use the new Type BD or Type CD Motor.

Complete information is available at your nearest G-E office —or G-E Motor Dealer

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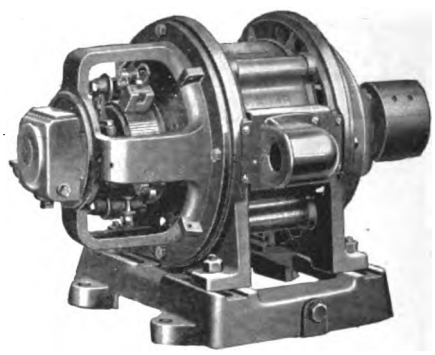
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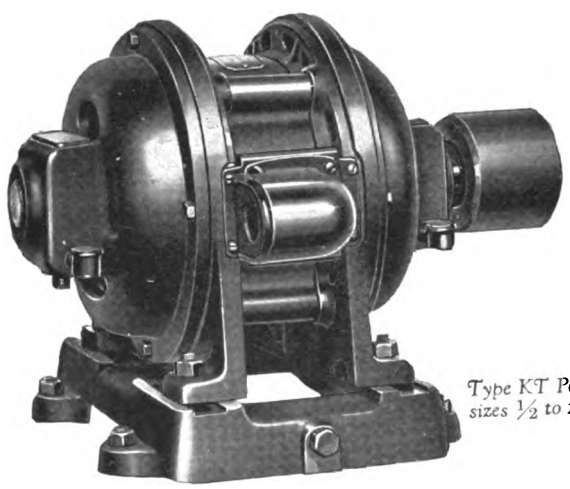
IMPROVEMENT

IMPROVEMENT is the keynote in the design, manufacture, application and servicing of G-E Motors—improvement in mechanical strength, simplicity, and interchangeability—improvement in workmanship, material, and test—improvement in appearance and finish—improvement in stock, warehousing, repair and service facilities.

Thus, all G-E Motor purchasers are assured *balanced excellence* in the factors which make up complete user satisfaction.



Type SCR Single phase Motor —Sizes ½ to 10 h.p. inclusive.



Type KT Polyphase Motor— sizes ½ to 15 h.p. inclusive.

For general purpose uses paralleling the new Type BD and Type CD Motors, the Type KT (polyphase) and the Type SCR (single phase) alternating-current Motors are successfully operating in thousands of installations. Whatever the circuit requirements or demands of service—there is a G-E Motor to fit the need.

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G-E Centrifugal Compressors for Pneumatic Handling

Pneumatic conveying—mail, cash, order slips, pulverized materials, and even heavier products such as razor blades—has been a boon to many industries in saving labor costs, conserving health and making for better working conditions.

The extensive research of General Electric engineers in the study of air compressors has been extended to those particularly adapted to pneumatic conveying and of smaller types for the pneumatic delivery of orders between departments.

G-E Compressors are to be found on all kinds of pneumatic conveying systems aiding in efficient and continuous operation.

Our nearest sales office is ready to give complete information.

Other G-E Centrifugal Compressors are successfully performing for every form of blower service which includes blowing blast furnaces, distributing gas, exhausting gas, blowing cupolas, agitating liquids, blowing water gas, scavenging Diesel engines, supercharging engines, and furnishing air for oil-burning furnaces.

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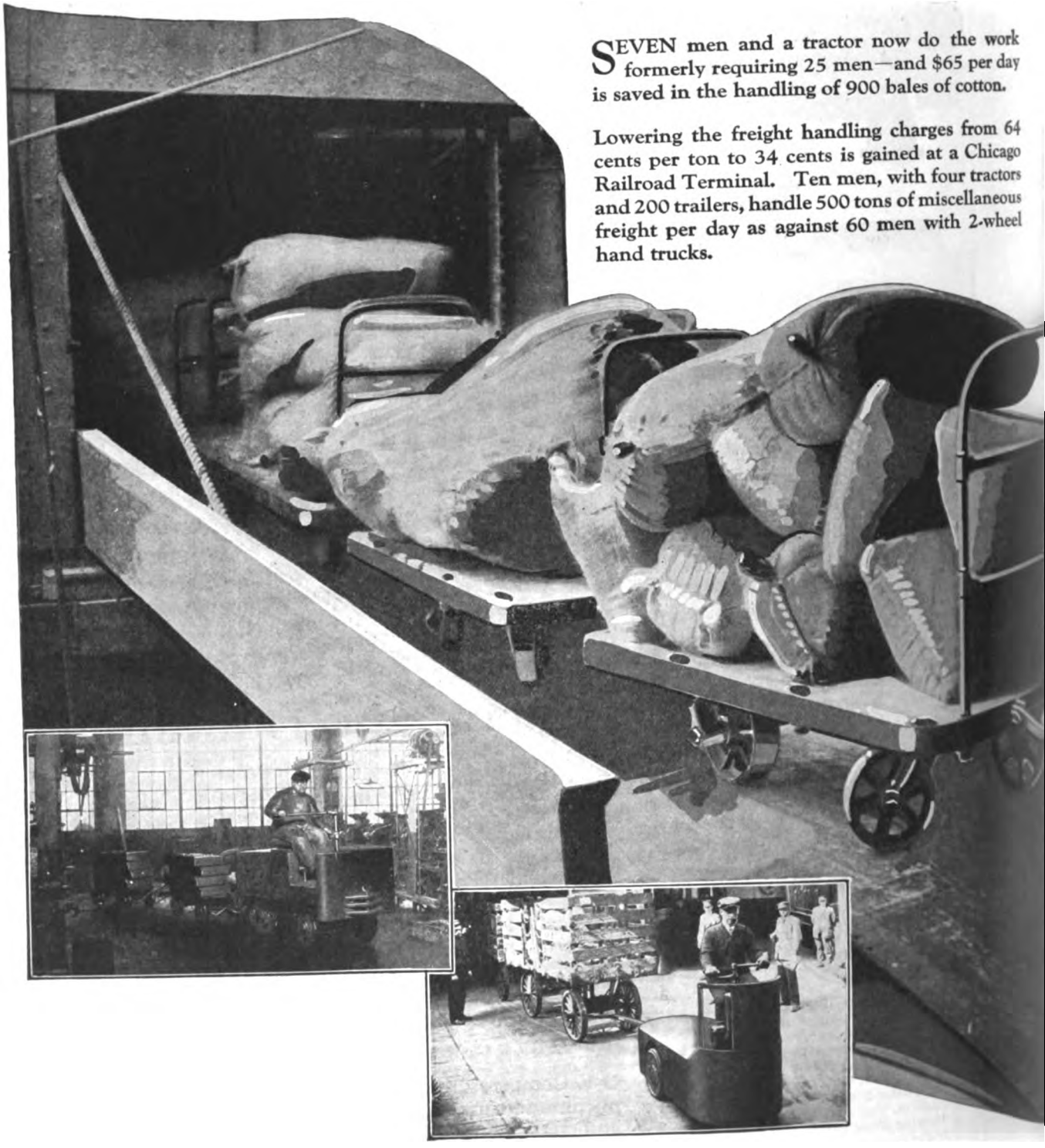
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Consider the Tractor's

SEVEN men and a tractor now do the work formerly requiring 25 men—and $65 per day is saved in the handling of 900 bales of cotton.

Lowering the freight handling charges from 64 cents per ton to 34 cents is gained at a Chicago Railroad Terminal. Ten men, with four tractors and 200 trailers, handle 500 tons of miscellaneous freight per day as against 60 men with 2-wheel hand trucks.



GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

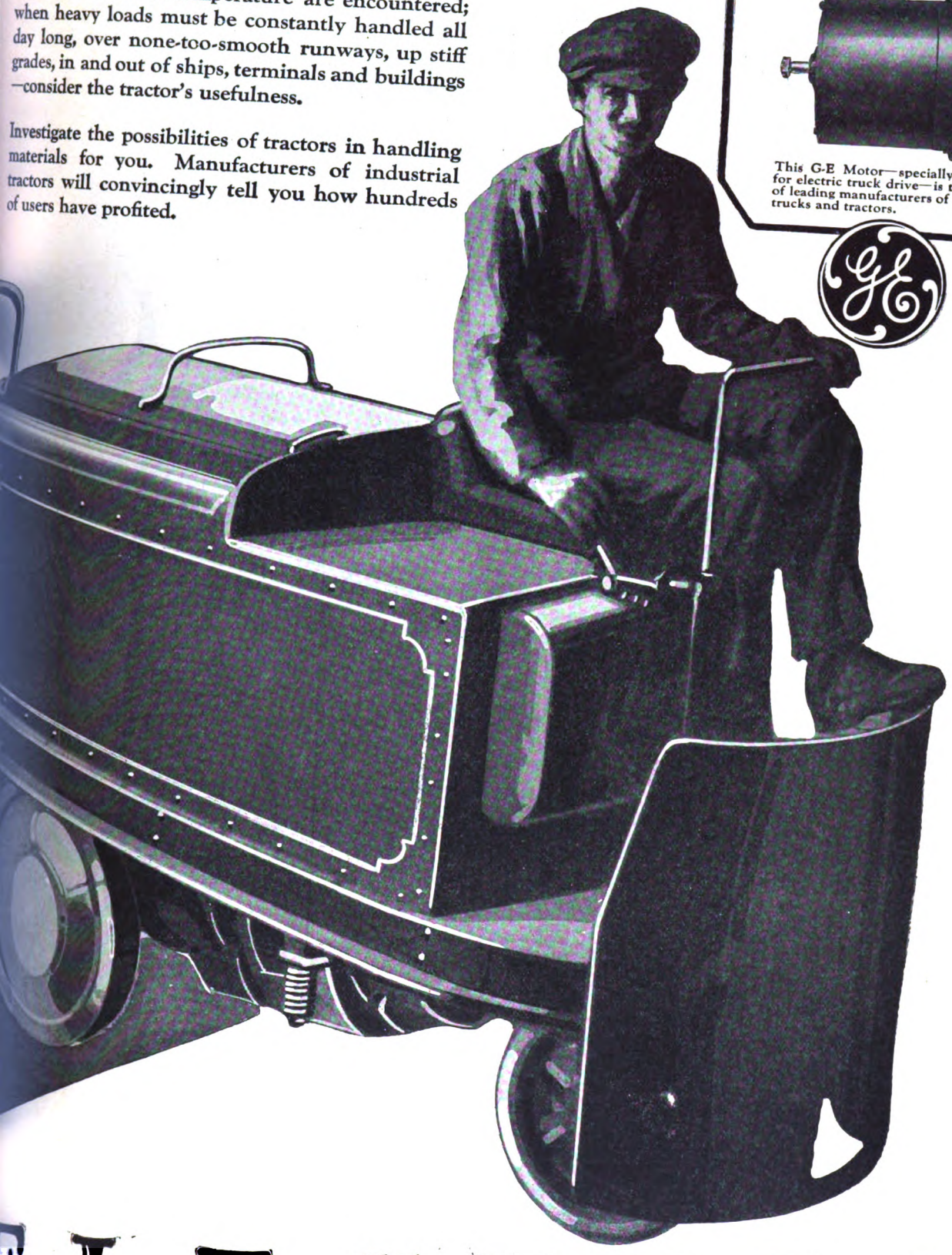
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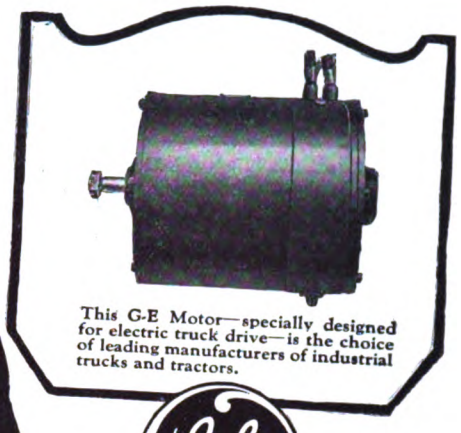
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Usefulness—

Where extremes of temperature are encountered; when heavy loads must be constantly handled all day long, over none-too-smooth runways, up stiff grades, in and out of ships, terminals and buildings —consider the tractor's usefulness.

Investigate the possibilities of tractors in handling materials for you. Manufacturers of industrial tractors will convincingly tell you how hundreds of users have profited.





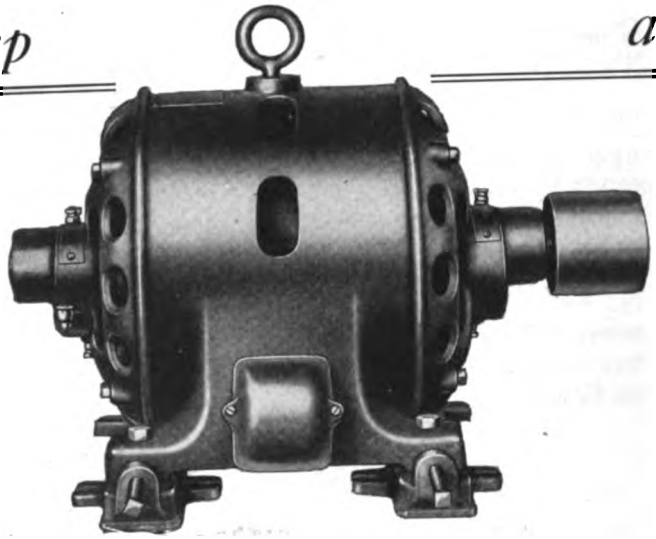
This G-E Motor—specially designed for electric truck drive—is the choice of leading manufacturers of industrial trucks and tractors.

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"They Keep a-Running"



And Here's a Motor—
Specially Adapted to Conveyor Service

Rugged phosphor-bronze bearings, as nearly dust-tight as it is possible to build them—this is ONE feature that makes Century Squirrel Cage Induction Polyphase Motors stand up under the heavy service requirements of conveyor drives.

Long bearing life is assured by the use of only the highest grade phosphor-bronze bearing metal in Century Motor bearings. They are cast from metal heated in electric furnaces in the Century plant—each individual heat being under absolute control and its composition accurately determined. They are machined overall to micrometer dimensions and provided with machine-cut figure-8 oil grooves which insure thorough oil distribution.

Century bearings withstand the pounding of gear and chain drives and pressure from unintentionally heavy belt tension—lateral shifting is prevented by a heavy shoulder at one end of the bearing.

Bearings as Nearly Dust-tight as It Is Possible to Build Them

The bearing housings of Century Type SC Motors are as nearly dust-tight as it is possible to build them. *They remain so throughout the life of the motor*—your assurance that Century Type SC Motors are continually safeguarded against the action of dust, grit, dirt and other abrasive particles.

Send for Full Data

The complete bearing assembly of Century Type SC Motors is fully described and illustrated in Bulletin No. 38. Send for your copy today.

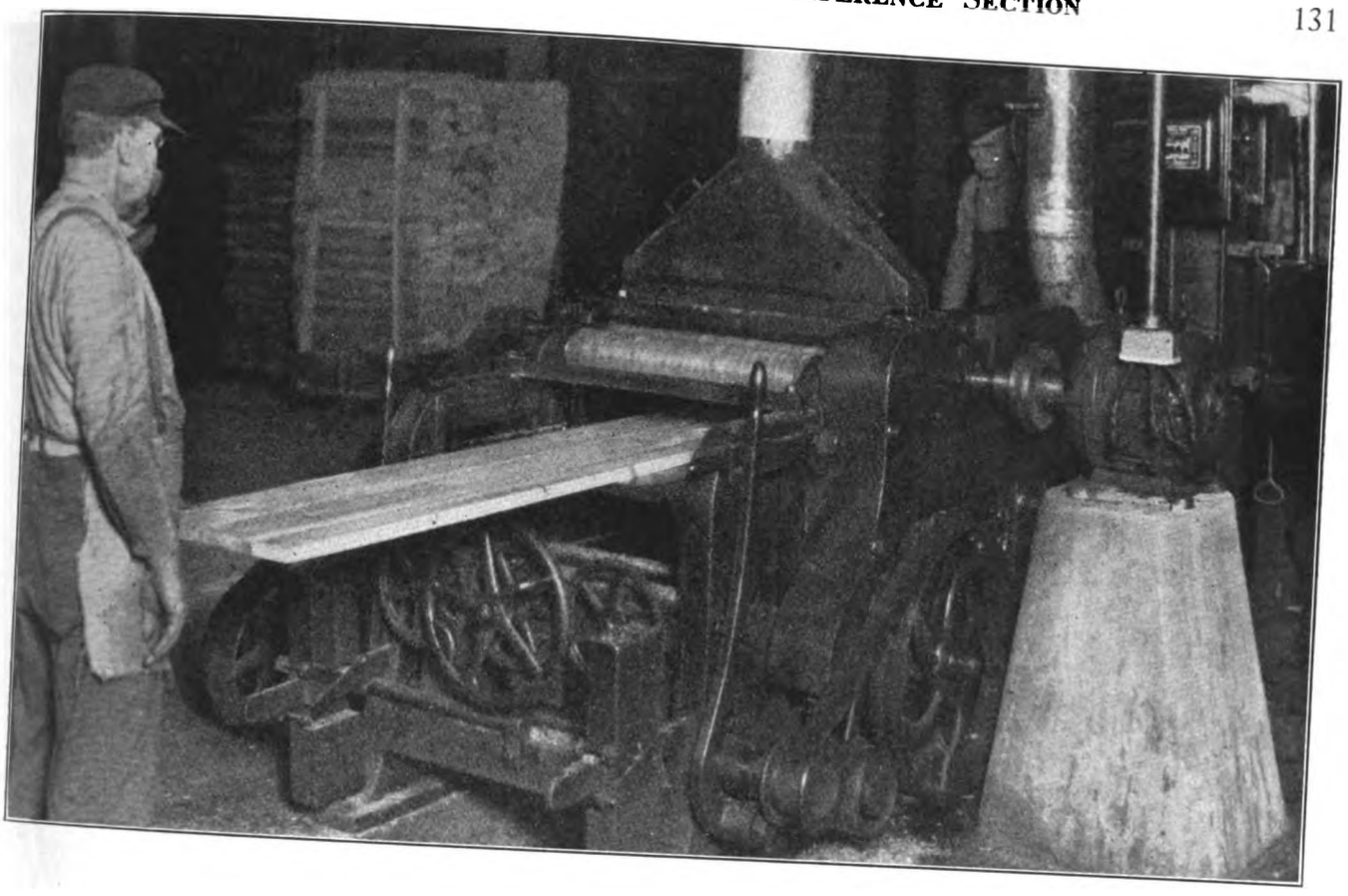
Built in all standard sizes from ¼ to 50 horsepower—temperature rise not more than 40° Centigrade.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

29 Stock Points in the United States and more than 50 outside thereof

¼ to 50 H.P. Century MOTORS ¼ to 50 H.P.

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Eighteen Months of Service Without a Dollar of Expense



Valley Polyphase Motor

In the eighteen months since 103 Valley Ball Bearing Motors were installed by the St. Louis Coffin Company, not a dollar of expense has been incurred for service or repairs of any sort.

The total oil consumption has been one quart. Oiling has been necessary only once—at the end of the first year.

This is in marked contrast to the attention required by the babbit bearing motors which were replaced by the Valley installation. The old style motors required oiling and inspection weekly in addition to major repairs from time to time.

But this is not unusual. It is only another demonstration that the delivery of continuous power with unusual operation economy is all in the day's work with Valley Ball Bearing Motors.

Before you buy or recommend another installation of motors, it will pay you to get all the facts about Valley Ball Bearing Motors. Write for Descriptive Booklet No. X.

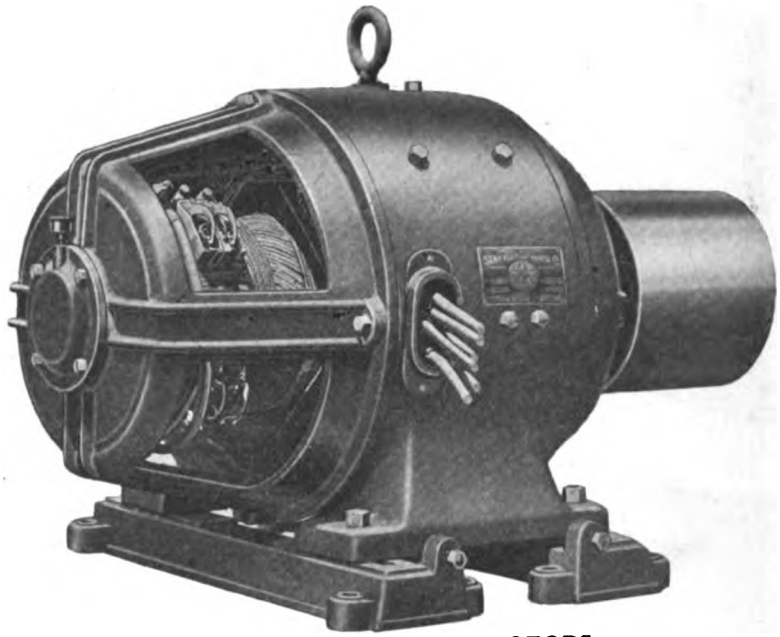
VALLEY ELECTRIC COMPANY

3157 S. Kingshighway **St. Louis, Mo.**

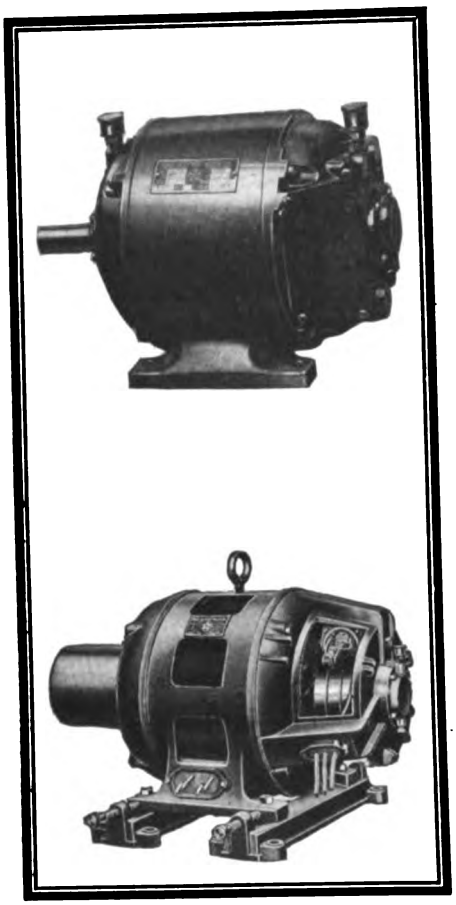
Valley Electric

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STAR BALL-BEARING MOTORS



Adopted as Standard Equipment by the Most Prominent Manufacturers of Material Handling Machinery

Attention is directed to our very Complete Line of Hoist Motors in sizes from 1 to 7½ H.P. and built for all standard voltages and commercial frequencies. The "mounting dimensions" of these motors either A.C. or D.C. are interchangeable; and the mechanical features can be designed to suit special requirements of the hoist Manufacturer.

Motors A.C. and D.C. ranging from 1 to 60 H.P. Incl., ruggedly designed, and especially built for Elevators, Cranes, Conveyors and Material Handling Devices.

We also manufacture for all commercial purposes a complete line of HIGHLY EFFICIENT, 40°C: D.C. and A.C. Polyphase Motors in sizes from ¼ to 75 H.P. Incl.; and of both Horizontal and Vertical Shaft Construction.

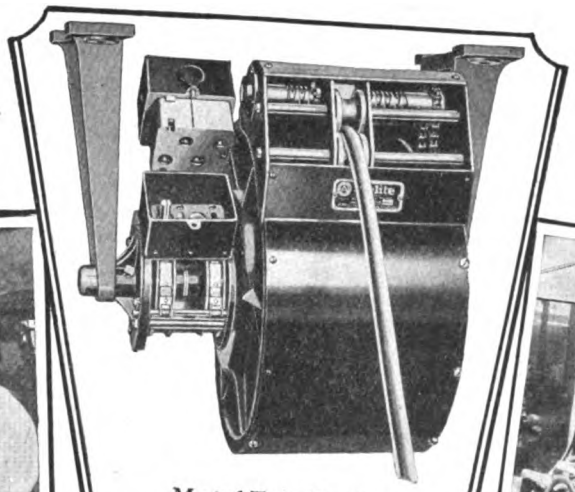
Write for particulars

STAR ELECTRIC MOTOR CO.

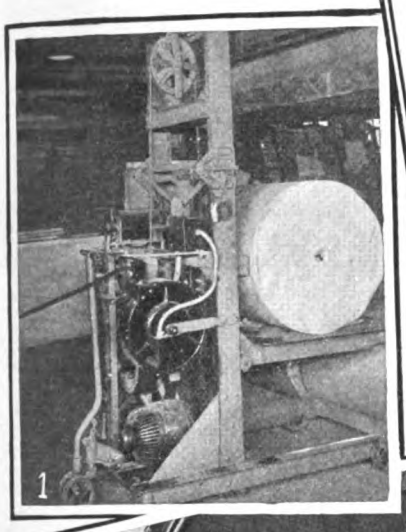
Miller and King Streets and N. J. Railroad Avenue
Newark, N. J., U. S. A.

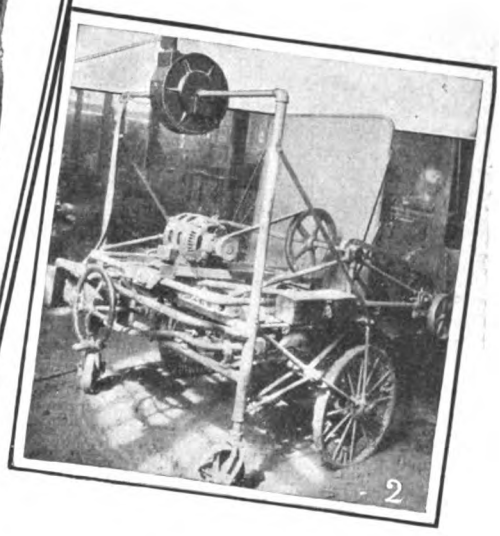
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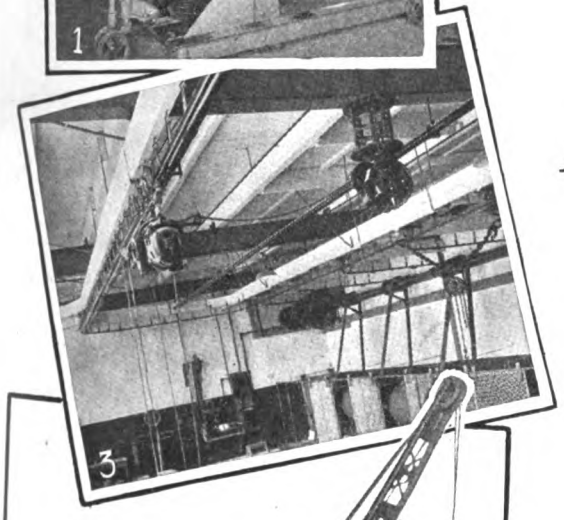
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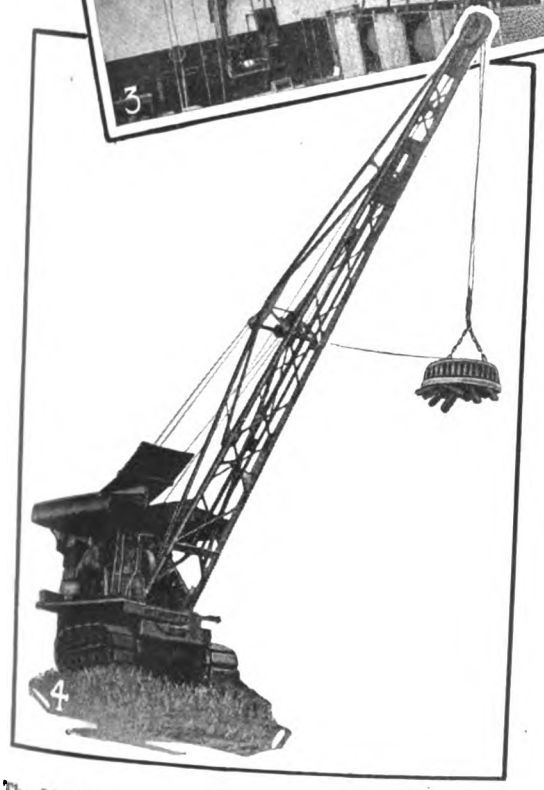


Mogul Type Reelite
There is a Reelite for every power extension requirement—the smaller sizes take care of portable tools and lights.









A Few of the Many Uses for Reelites

THE Mogul Type Reelite finds a profitable use wherever power is to be carried to portable equipment — on all kinds of mobile machines, cranes, dredges, electric magnets, railroad and mining machinery, etc. The cord is kept coiled in a container, clean and unkinked, and is automatically unreeled and retrieved as the location of the equipment demands. This saves considerable time and trouble, and frees the cord from wear, which in turn keeps the machine in service — adding profits instead of losses.

Here are pictured some typical applications of the Mogul Type Reelite. Probably they can suggest a similar use for you.

Our engineers will gladly explain how it saves in operating costs, convenience, safety, and how it can be adapted to your requirements. Ask them.

APPLETON ELECTRIC COMPANY
General Offices and Factory
1716 Wellington Ave., Chicago
New York 265 Canal St.
Los Angeles 340 Azusa St.

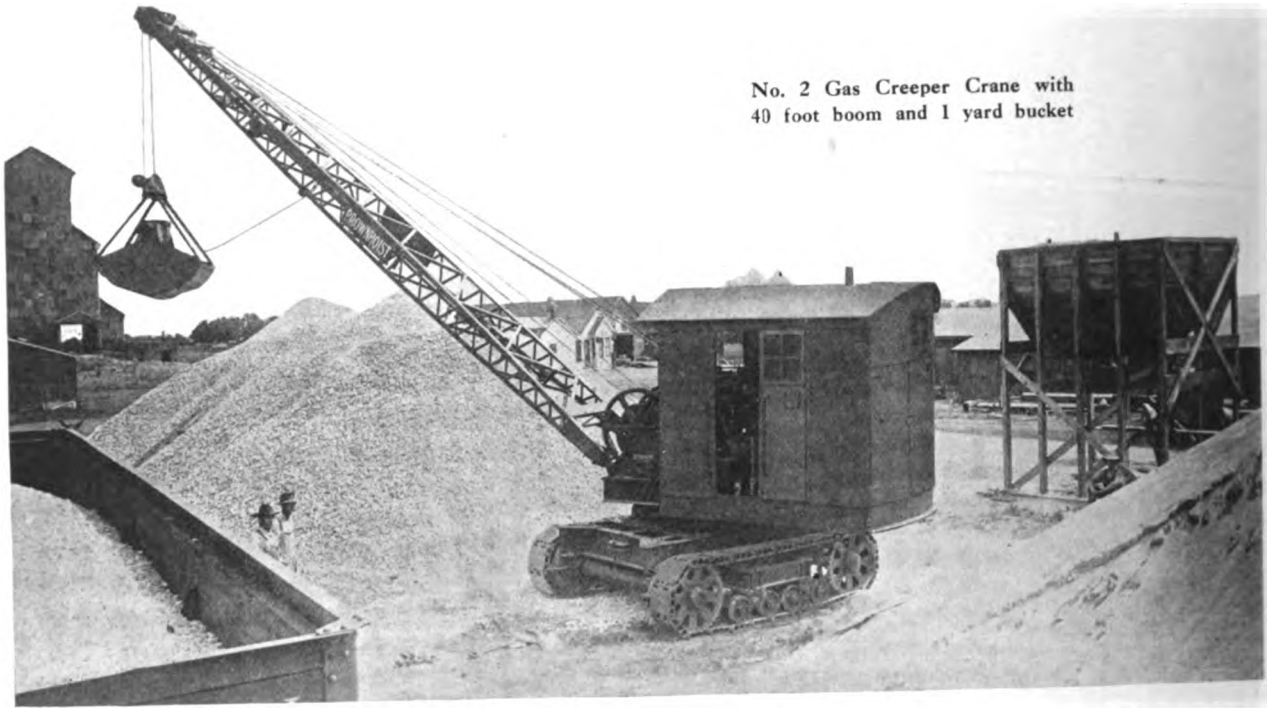
MOGUL TYPE Reelite
REG. U.S. PAT. OFF.
KEEPS THE MACHINE IN SERVICE

The Mogul Type Reelite is effecting savings on

1. Portable Elevator
2. Electric Sandcutter
3. Overhead Carrying Equipment
4. Crawler Crane with Electric Magnet

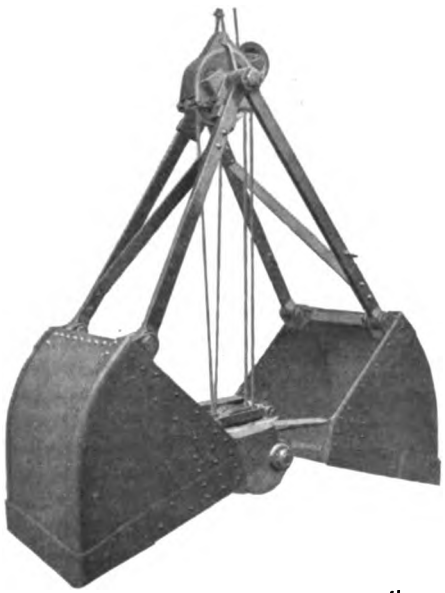
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No. 2 Gas Creeper Crane with 40 foot boom and 1 yard bucket

Thousands Have Found Brownhoists



Brownhoist Clamshells are ruggedly built, fast operating and are excellent diggers. They are especially suited for sand, gravel and coal handling.

Wouldn't it be worth real money to you to be able to write this sort of a letter about your material handling?

"Our Brownhoist crane has handled approximately 66,000 tons of crushed stone and 47,000 tons of sand during the past three seasons. Our repair bill has been less than $100 including ropes, and from all appearances this crane will be good for ten years more," writes the Devine Construction Company, owners of this crane.

The small sum spent for repairs on a Brownhoist crane not only makes it an economical handling unit, but you are free from the breakdowns which are so costly. You'd enjoy reading our Catalog K. It shows the many different types and sizes of Brownhoist cranes doing every kind of handling work. Just write for it.

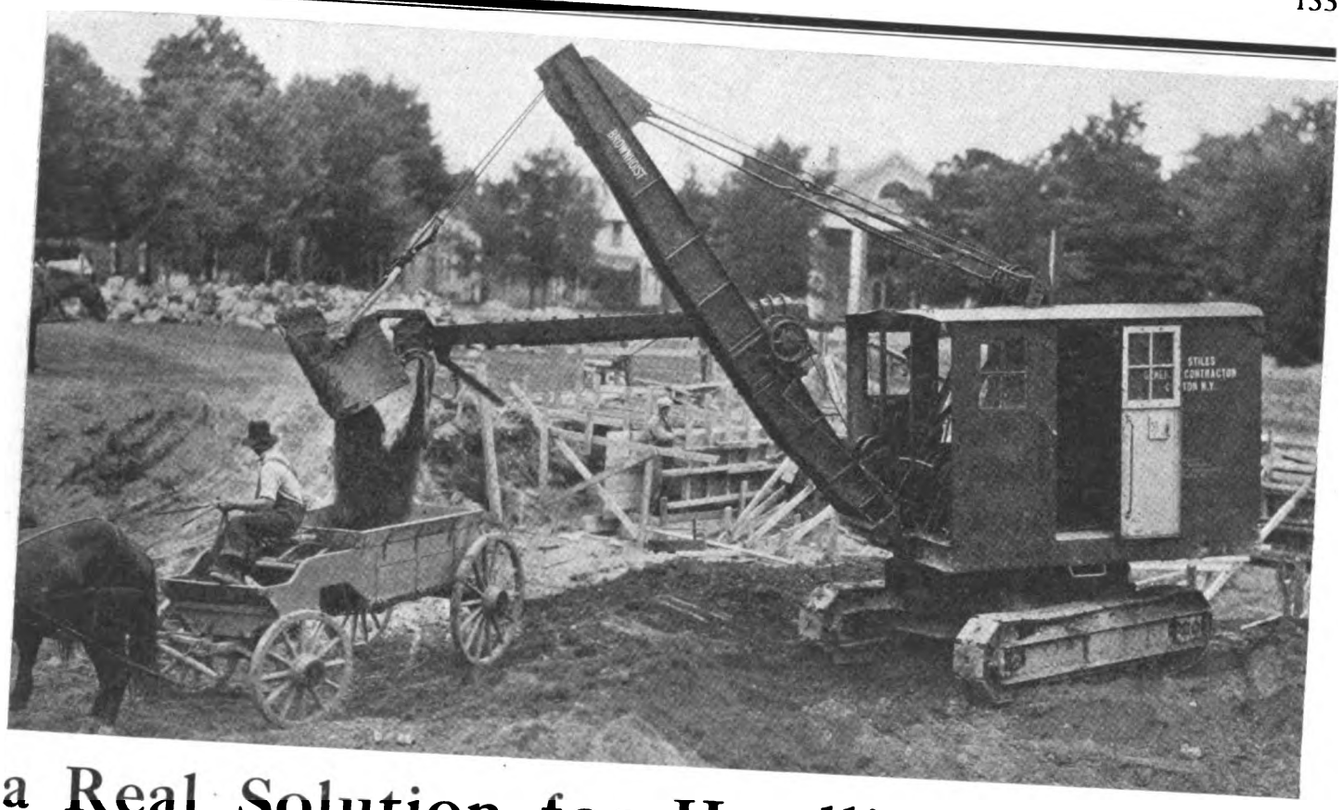
The Brown Hoisting Machinery Co., *Cleveland, Ohio*

Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans

BROWNHOIST

GOOD MATERIAL HANDLING MACHINERY

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a Real Solution for Handling Problems

There's long life and economy in the accessible deck arrangement of the Brownhoist 1/2 yard gas shovel-crane. There are only 18 gears on the whole machine, all big and quiet running. The engine take-off gears are enclosed and run in an oil bath. All other parts are slow running.

You would not buy this No. 1 shovel-crane just because the deck units are all accessible and sturdily built, though these qualities do save a crane owner real money. But learn also of the exclusive pivot steering which turns the machine in its own length, its speed of operation and its rugged strength.

These and many other profit winning features are fully described and illustrated in our latest shovel-crane booklet—send for a copy to look over.



The No. 1 with ½ yard clamshell bucket on 30 foot boom. The Brownhoist rope crowd reduces the time of converting from shovel to crane to two or three hours, as it is only necessary to change booms.

The Brown Hoisting Machinery Co., *Cleveland, Ohio*
Branch Offices: New York, Chicago, Pittsburgh, San Francisco, New Orleans

BROWNHOIST

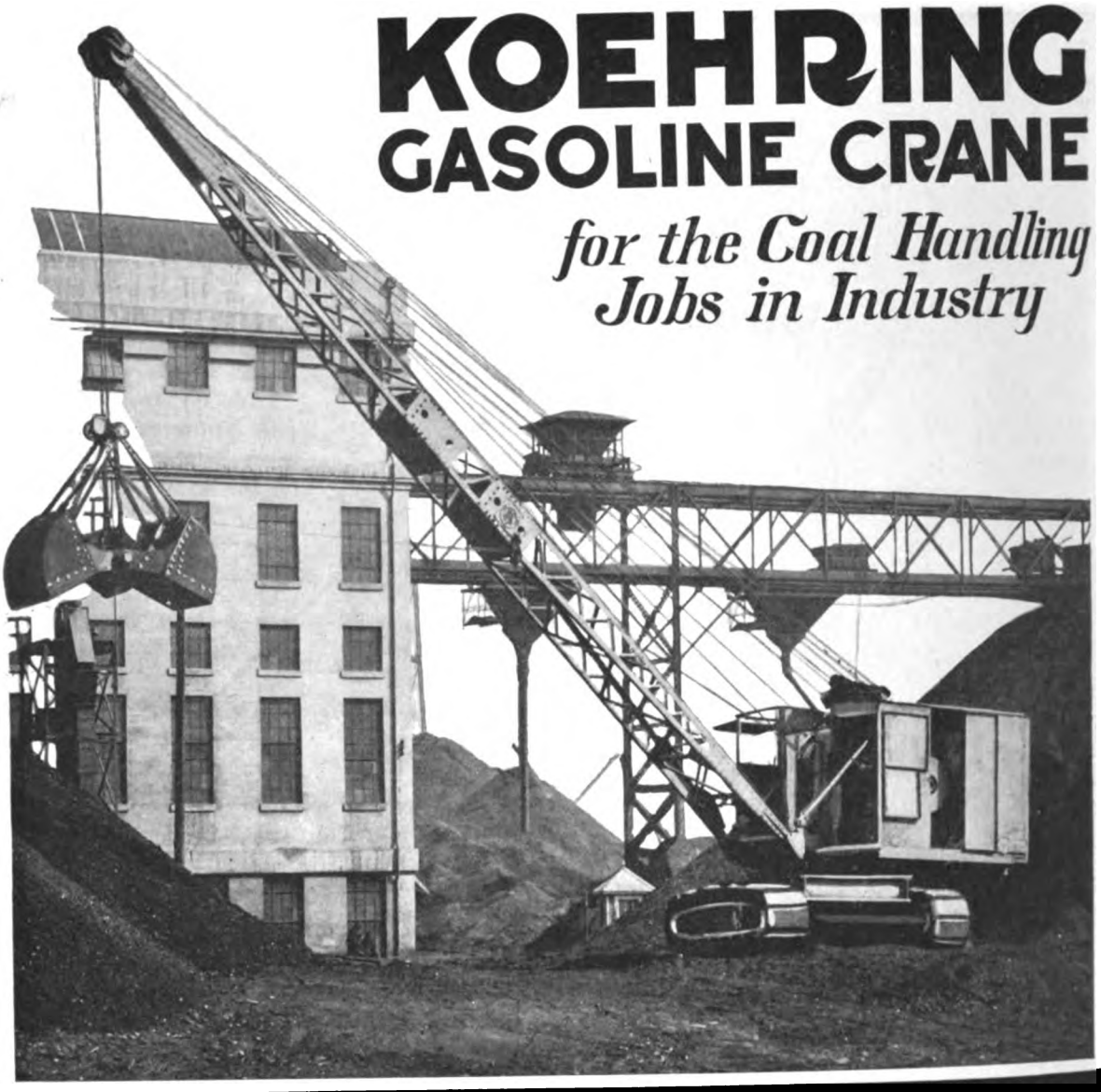
GOOD MATERIAL HANDLING MACHINERY

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KOEHRING GASOLINE CRANE

for the Coal Handling Jobs in Industry



THE KOEHRING Gasoline Crane is an ideal unit for the heavy handling of coal, ashes and other bulk materials.

The power, easy mobility, speed of operation and ease of control of the KOEHRING appeals to the plant manager who is looking for low costs in every handling job around the plant.

Koehring levers are shifted with the ease of automobile gear shifting by means of the Finger Tip Control. This is achieved by the use of double outside band, equalized friction clutches, which speed up operation and preserve for the operator the "feel" of the work—an important consideration in handling material.

Write for the KOEHRING Bulletin giving all the details.

Crane Capacities

No. 1 10 tons at 12 ft. radius ¾ cu. yd. clamshell bucket on 40' boom, standard, 4-cylinder, 5 x 6 in. gasoline engine, 1000 R. P. M.

May also be interchangeably equipped with block and hook and electric magnet.

No. 2 15 tons at 12 ft. radius. 1 cu. yd. clamshell bucket on 45' boom, standard, 4-cylinder, 5¾ x 7 in. gasoline engine, 1000 R. P. M.

KOEHRING HEAVY DUTY

KOEHRING COMPANY

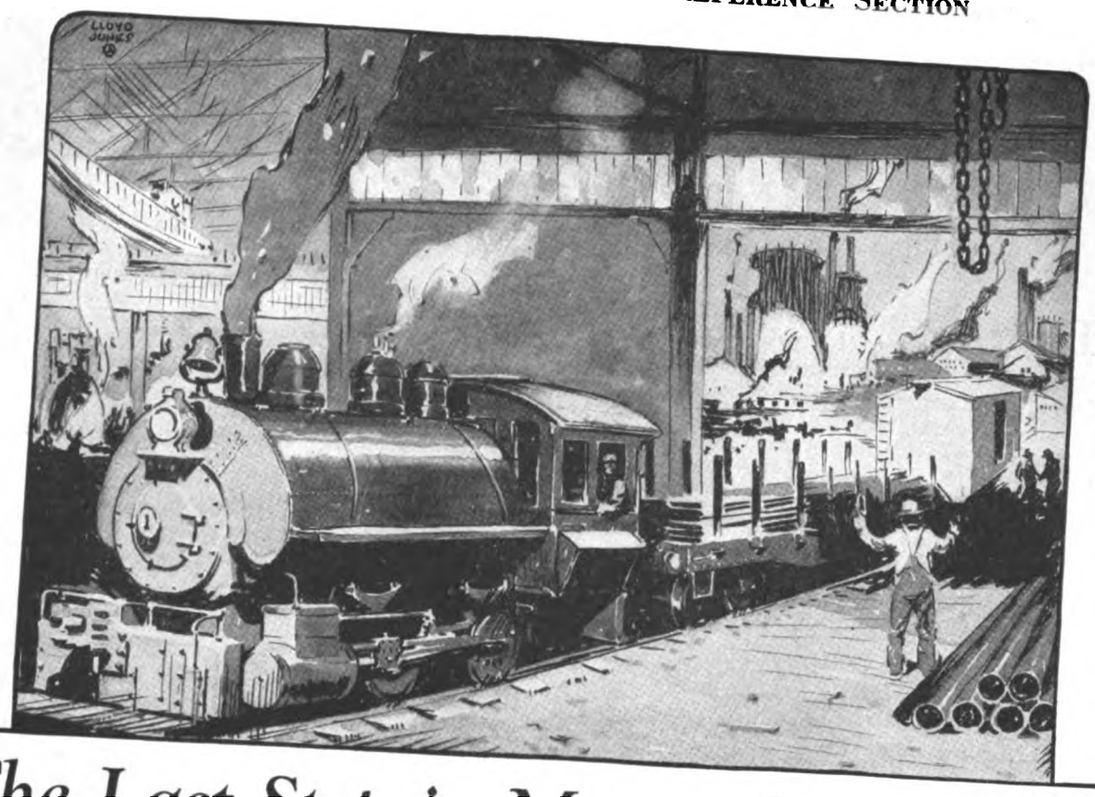
Pavers—Mixers
Gasoline Cranes, Draglines and Shovels

MILWAUKEE WISCONSIN

Sales Offices and Service Warehouses in all principal cities
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The Last Step in Material Handling

THE last step—and a very important one—is the final removal of the finished product, out of the factory and on the way to your waiting customers.

A study of factory operation has shown that often in a highly systematized plant, the present method of car removal is considered something that must be tolerated, no matter how inefficient.

Car movement can be improved and operated just as efficiently as the rest of your plant—by using a privately-owned locomotive.

For twenty-five years, we have been showing plant executives how this operation can be improved [often at a saving over the charge made by the railroad for car movement] by fitting the proper-sized locomotive to the particular job it must perform.

Our engineers are ready to study your requirements, and their assistance implies no obligation.

DAVENPORT LOCOMOTIVE WORKS
Designers and Builders of Steam and Gasoline Locomotives
2507 Rockingham Road · Davenport, Iowa

How Large Must a Plant Be to Need a Locomotive?

The size of your plant alone does not determine your need of a locomotive.

The time you can save in speeding up shipments, the large amount of raw materials that can be unloaded, the immediate dispatch of inter-plant hauling, and the saving of the switching charges conclude your need.

If a privately-owned locomotive can add this to the efficiency of your plant operations, you will not only need one, but will want one at once. Write for the folder, "Choosing the Locomotive for the Industrial Plant."

Davenport Locomotives

Dependable in every Industrial Service

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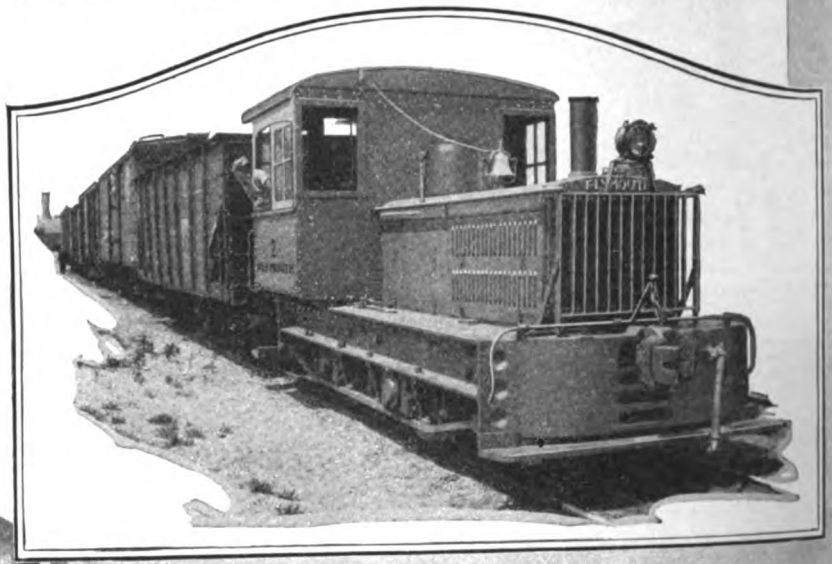
Economy-Power-Service

THAT, in a nutshell, is what you get when you put a Plymouth Gasoline Locomotive on the job.
Economy—because it costs less to operate than any other motive unit.
Power—because it hauls seemingly impossible loads with ease.
Service—because it is always ready, simple to operate and maintain.
Plymouth Gasoline Locomotives are creating new history in industrial haulage.
You owe it to yourself to investigate this money-making, time-saving haulage method.

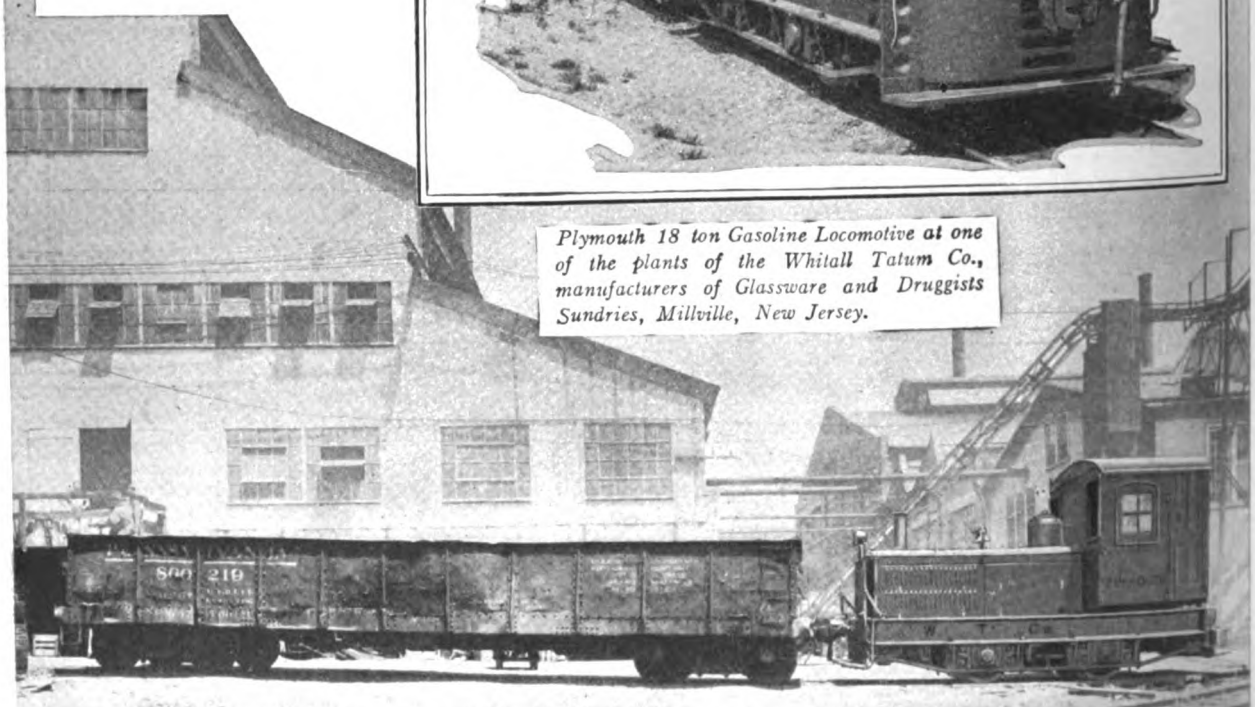
Write for Catalog and Performance Bulletin "B".

THE FATE-ROOT-HEATH CO. (*Plymouth Locomotive Works*) Plymouth, Ohio

Plymouths are made in 3 to 20 ton sizes, and in every gauge of track, to meet every condition.



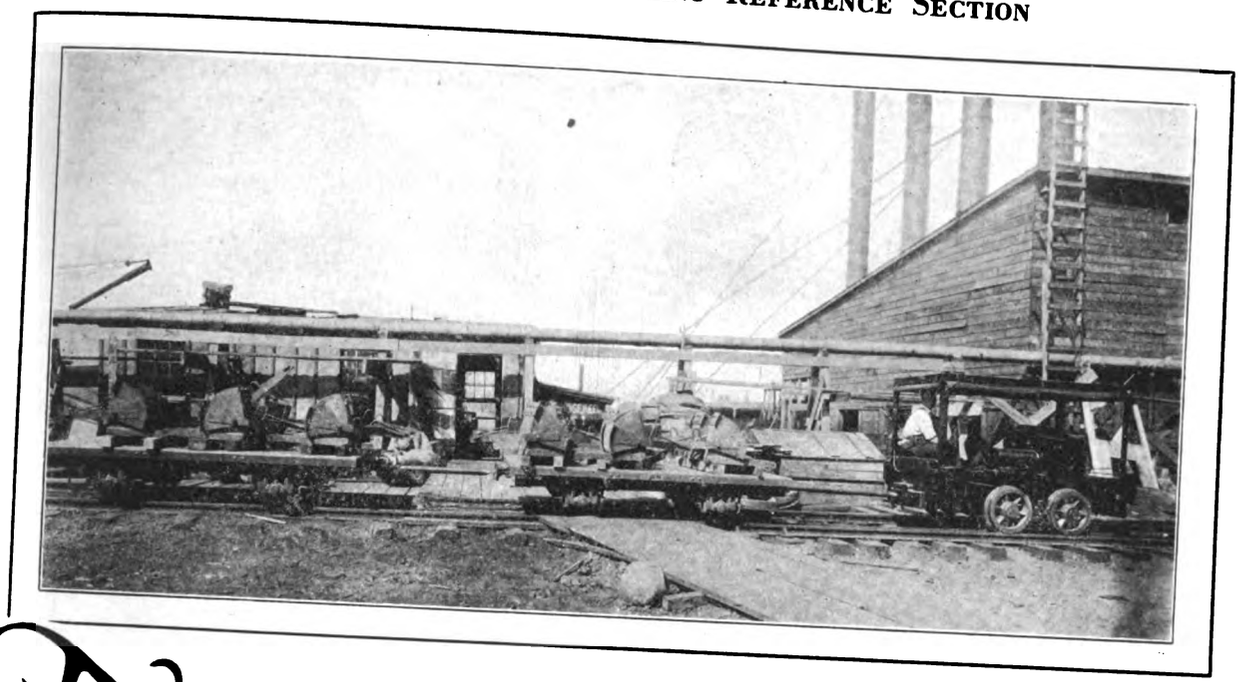
Plymouth 18 ton Gasoline Locomotive at one of the plants of the Whitall Tatum Co., manufacturers of Glassware and Druggists Sundries, Millville, New Jersey.



PLYMOUTH
Gasoline Locomotives

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For Low Cost Haulage the Ford Ton Power Unit



At the Philadelphia Electric Co.

Materials handling is being efficiently and economically performed thru a fleet of Brookville Ford Ton Truck Locomotives.

The Brookville Locomotive utilizes the Ford motor, noted for its wonderful power and low maintenance cost.

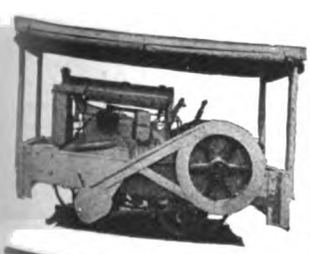
It is being used in many plants for hauling coal, ash disposal, brick, heavy castings and other material between buildings and through the plants.

Your conditions may not permit the use of large locomotives. Nor requirements necessitate the heavy high priced units. Consider the Brookville and its utility for many hauling jobs. It will help to cut the cost of your materials handling. Will replace man power, mule power, and high priced electric and steam equipment.

Write for Bulletins B-1 and B-4.

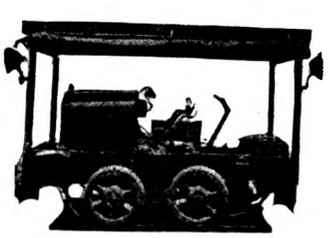
Brookville Truck & Tractor Company

BROOKVILLE, PENNSYLVANIA.



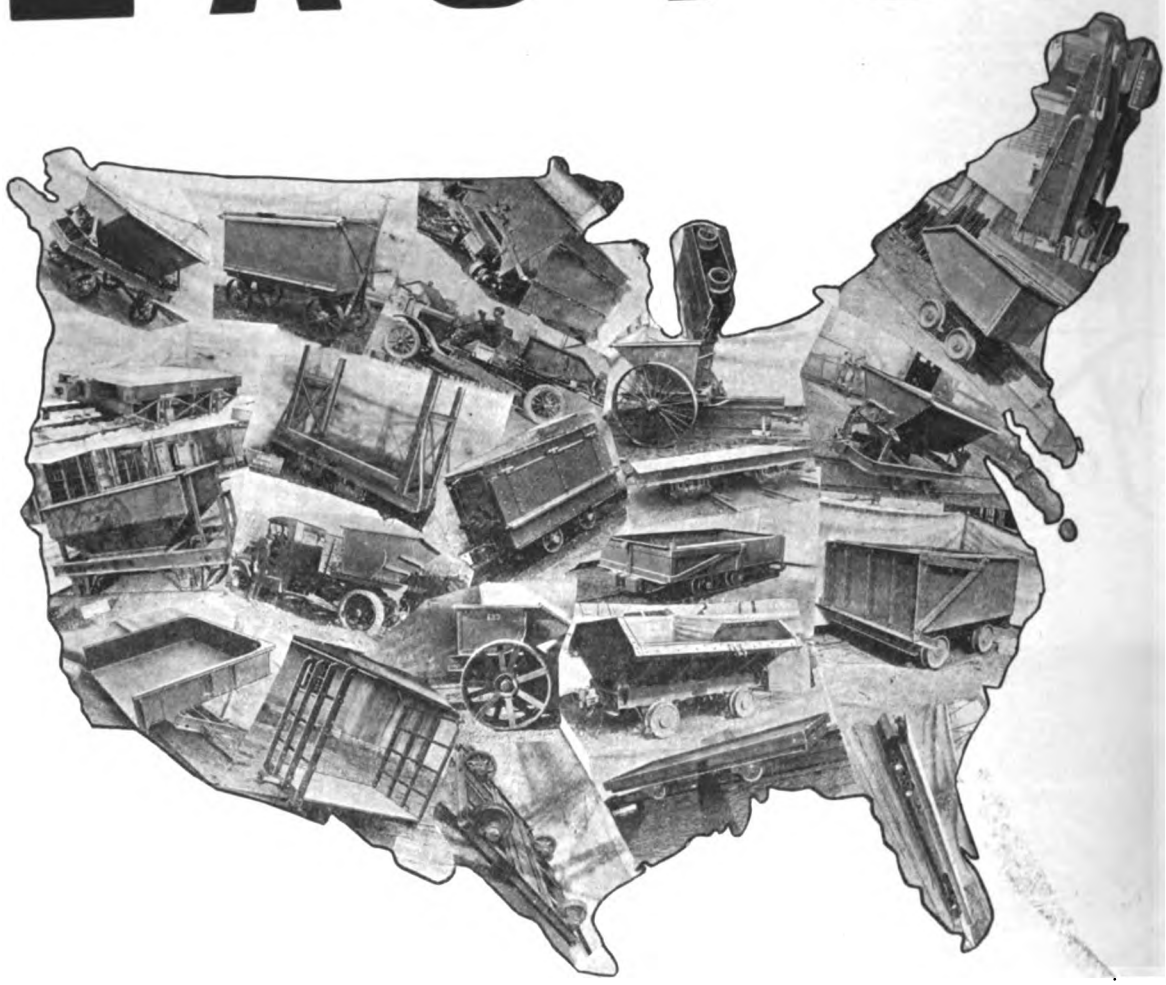
Specifications

Brookville Locomotives are Ford Ton Truck and Fordson driven. The Brookville Fordson Locomotive uses as its power unit the standard Fordson Tractor, positively without change or alteration other than discarding wheels and front axle assembly. Furnished all gauges in standard weights of 3½ and 4 tons. The Brookville Ford Ton Truck Locomotive uses as power unit the complete Truck mechanism including motor, transmission and differential, plus auxiliary reverse. Furnished standard gauges 18" to 56½" in 1½, 2 and 2½ tons weight. All models especially designed for rough and crooked track. Locomotive features second to none; plus local Ford Service on driving mechanism.



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EASTON EQUIPMENT EVERYWHERE

EASTON CAR & CONSTRUCTION CO.

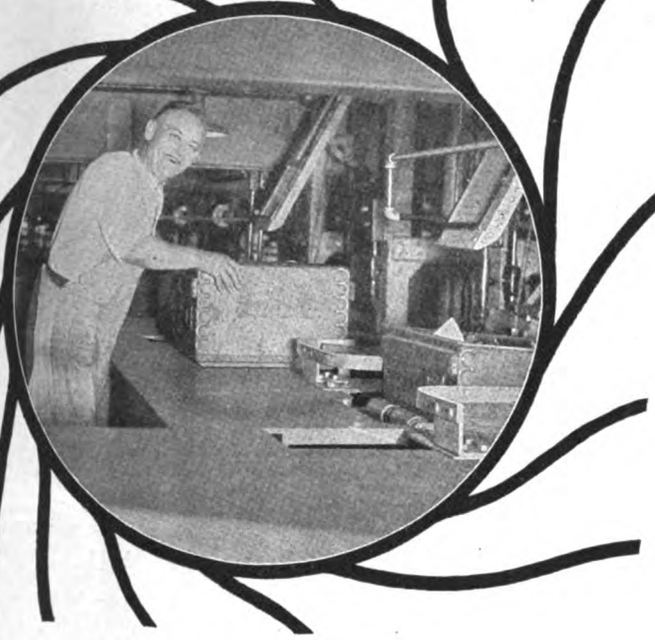
Offices and Works

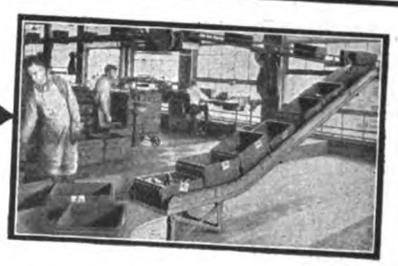
EASTON, PA. KANSAS CITY, MO.

EASTON CAR

FOR EVERY INDUSTRIAL PU

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A "traffic cop" of production

This man, in a central switch tower, directs millions of tote boxes a year over the intercommunicating conveyor system in the great National Cash Register plant, Dayton, O. Complicated traffic movements are made simple. Deliveries of parts between departments on many floors in four buildings are quicker, more positive. Production costs have been cut.

How traffic control in the plant boosts production—cuts costs





ARE your department and buildings scattered? Do you move parts between operations by hand? Then a chart of your plant will probably show many gaps in the production flow—points where materials are delayed—places where product piles up in one department waiting to be carried away, while other departments are waiting for these same materials.

By controlling and speeding this traffic in materials with conveyors, you can make big gains in production and economy. Conveyors bridge the time-wasting, production-halting gaps between operations. They carry materials in continuous, unbroken streams, where they should go. Idle time is done away with. Cluttered benches and floors are freed for productive work. Widely separated buildings and departments are virtually brought together.

Yours may be a problem of linking many departments with intercommunicating conveyors, like the system in the National Cash Register plant—or a simple conveyor between separated departments may serve your purpose.

In any case, it will pay you to investigate further. Our engineers will be glad to help you. They will cooperate with your engineers or production manager, or they will assume the entire burden of making preliminary surveys and plans.

If you prefer, send for our bulletin, I.S.-16. It is packed with specific examples of how conveyors have increased production and cut costs for others. It may point the way to similar economies in your plant.

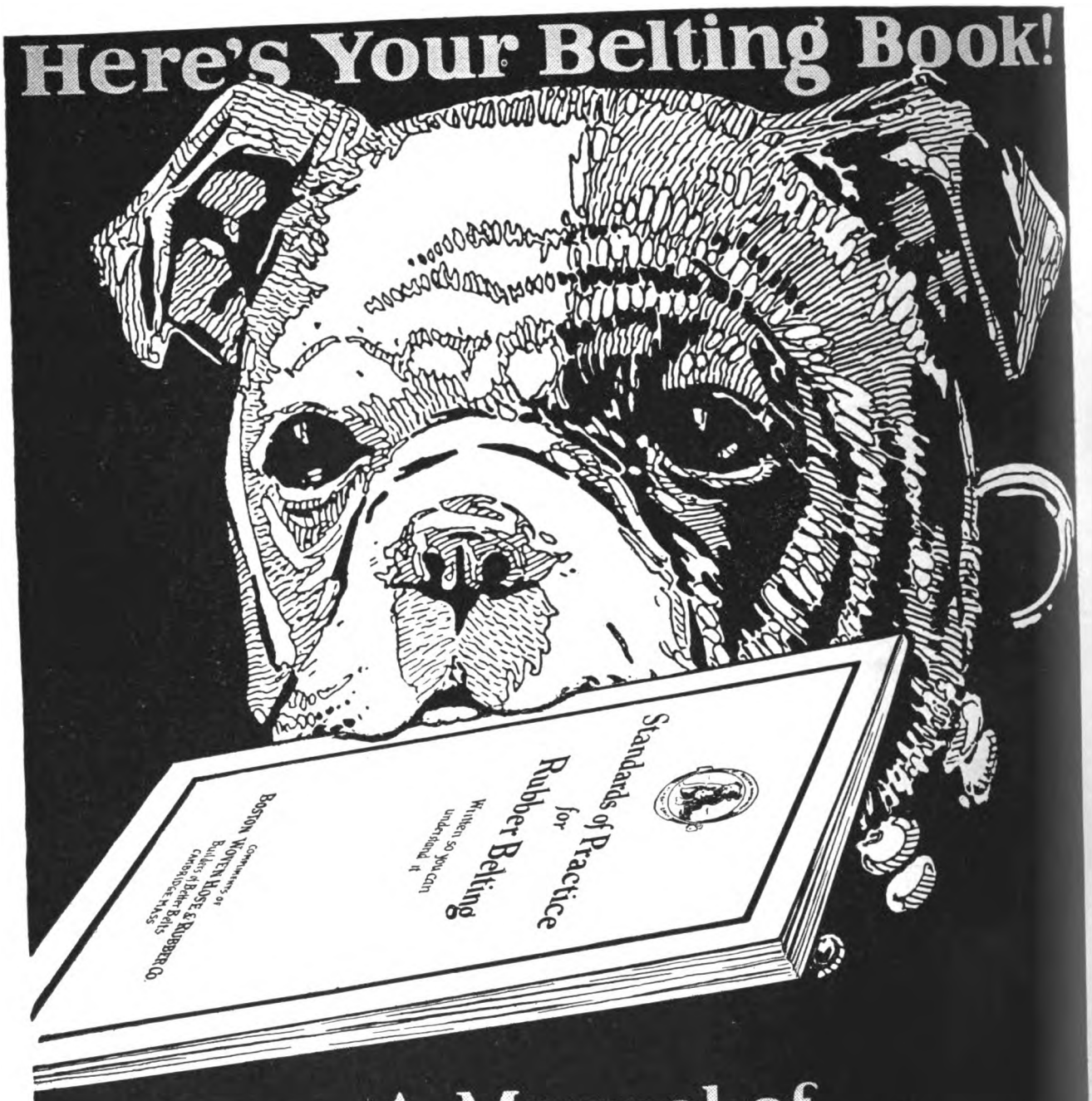
THE LAMSON COMPANY, SYRACUSE, NEW YORK

Branches in all principal cities

LAMSON · CONVEYORS

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Here's Your Belting Book!



A Manual of Belting Application written so you can understand it. Every buyer and user of belting will appreciate this readable book. *Send for your copy!*

BOSTON WOVEN HOSE & RUBBER CO., *Cambridge, Mass.*

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ON CARS AND CRANES



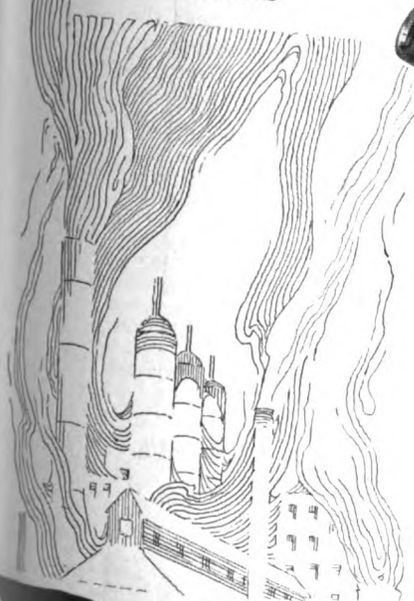
ON HOISTING MACHINERY



ON CONVEYORS



ON AUTOMATIC STOKERS



These manufacturers

have thoroughly tested all makes of lubricating systems and through those tests they have learned that the Dot High Pressure Lubricator gives quicker, cleaner and more *thorough* lubrication for all kinds of machinery.

The following leading manufacturers of material handling equipment have adopted the Dot as standard equipment.

N. P. Nelson Iron Works
Dodge Manufacturing Co.
C. W. Hunt Company
Lamson Company
Standard Conveyor Company
Warren Brothers
Wetzel Mechanical Stoker Co.
Paul Maehler Company
Underwood Machine Company
Allis-Chalmers Company
Thew Shovel Company
Erie Steam Shovel Company
Novo Engine Company
Byers Machine Company
Continuous Transit Company

Motorbloc Corporation
Specialty Engineering Company
Universal Road Machinery Company
Fate-Root-Heath Company
Elwell Parker Company
Browning Company
Universal Spader Company
Ransome Concrete Machinery Company
Ideal Concrete Machinery Company
Lyon Iron Works
The Russell & Company
National Engineering Company
Green Engineering Company
Riley Stoker Corporation

Equip your machinery with the Dot System. It adds years of useful service to your machinery and builds good will.

"You might as well have the best when it costs no more."

CARR FASTENER CO.

DEPT. B

31 Ames St., Cambridge, Mass.



The DOT Lubricator is thoroughly protected by allowed claims of pending patent applications.

Write for interesting Booklet—"Better Lubrication for all Machinery." It contains many instructive suggestions that will prove of value to you. It is free.

DOT TRADE MARK *high pressure* LUBRICATOR

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Production Schedules Maintained

Cleveland Worm Gear speed reduction units increase production by eliminating breakdowns under heavy service.

Save several times their cost by reducing motor investment.

An extract from a Nielsen survey by the Assistant Master Mechanic of one of the largest rubber manufacturers of Akron, Ohio.

"In the modern rubber manufacturing plant, as in practically every industry, the reduction of costs while maintaining a high standard of quality of the finished product is a vital factor. *Unless production schedules can be maintained, manufacturing costs will increase rather than decrease,* and thus the equipment used in the various processes must be dependable and capable of continuous operation.

Our experience has proved that the Cleveland Worm Gear speed reduction units embody these characteristics. There are over 75 such units in use throughout the plant driving conveyors, calenders, tube machines, etc. Some of them have been in use 6 or 8 years and are giving perfectly satisfactory service in many places under continuous operation with heavy loads. On elevators and conveyors where the drives are not easily accessible, the small amount of attention required by the Cleveland units and the limited space in which they can be used are valuable advantages.

An example of the dependability of Cleveland Worm Gear drives under continuous operation, is on our tube machines where they are subjected to the most severe service of any in our plant. On these machines, the Cleveland units transmit the power from individual 50 H.P. motors with variable speeds of 415 to 1,250 R.P.M. at a speed reduction of 4-5/6 to 1.

These machines are in operation 24 hours a day, which is three times the normal operation in the average plant, and their production is of first importance in keeping up to the manufacturing schedule for treads for all classes of tires.

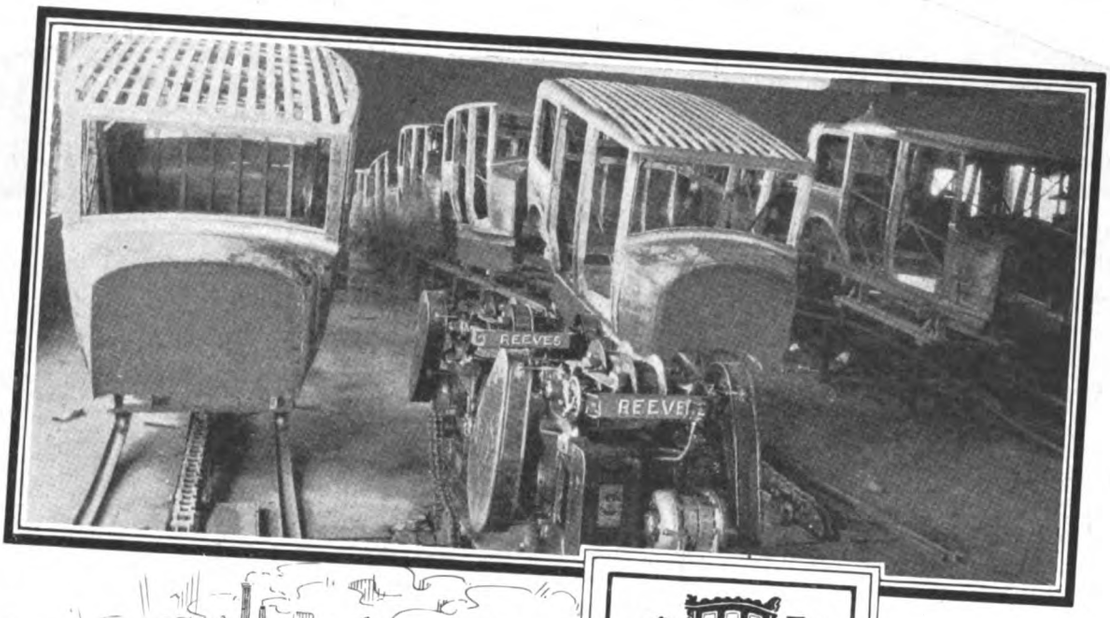
The first Cleveland units were put on some of these machines over 4 years ago and they have required absolutely no repairs due to any fault on their part. These gears seem to wear in rather than wear out. Their life is conservatively estimated at 15 years. As shown on the attached tabulation sheet, the total operating cost amounts to but $.112 per unit, per 8 hours."

A copy of this survey will be sent to those interested promptly upon request.

The Cleveland Worm & Gear Co.
3257 East 80th Street
Cleveland, Ohio

Cleveland WORM GEAR REDUCTION UNITS

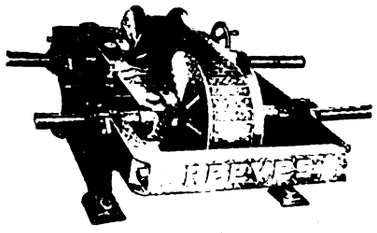
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Two REEVES Transmissions which give flexible speed control on body carrying conveyors at the Fisher Body Company, Detroit. Fisher uses 163 REEVES Transmissions.

Absolutely Flexible Control of Conveying Machinery Speeds!



The REEVES Transmission is a simple, compact mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. Accurate and dependable always.

THE REEVES Transmission gives the absolute flexibility so necessary in the efficient operation of material handling conveyors. It does not give just *steps* in speed—but *any* speed between fastest and slowest, even to the smallest fraction of a revolution. With it you can run *any* machine at *any* speed necessary to meet *any* different operating condition.

Progressive manufacturers everywhere use the REEVES Transmission because it is the one truly accurate means of variable speed control. Easy to install—simple to operate—pays for itself in a short time—lasts for years. Write for catalog L-44 and full information.

REEVES PULLEY COMPANY

Established 1887

COLUMBUS, INDIANA

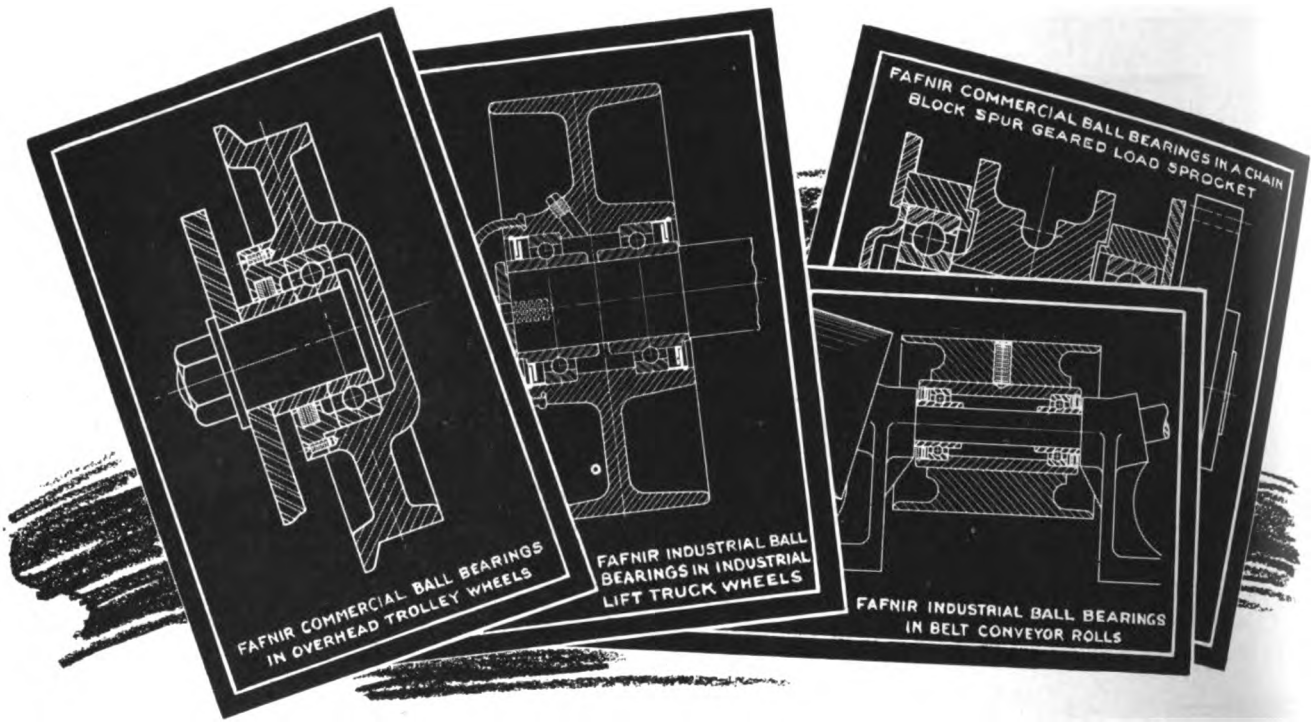
Manning, Maxwell & Moore, Inc.....New York & Boston
Reeves-Bond Sales Company.....Chicago
Reeves Pulley Company.....Detroit

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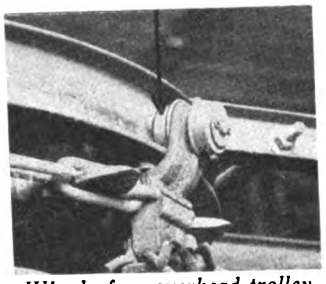
Variable Speed Transmission

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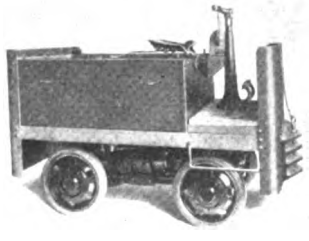
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Let Fafnir help you in applying ball bearings to material handling equipment



Wheel of an overhead trolley conveyor, running on Fafnir Ball Bearings.



A storage battery tractor,—electric motor, wheels and drive shafts mounted on Fafnir Ball Bearings.

By virtually eliminating friction and wear, the use of high grade ball bearings on industrial handling equipment does away with the innumerable inspections, adjustments and replacements demanded by other types of bearings. Transportation is accelerated. Worth-while savings in lubrication and maintenance are obtained.

Each truck, tractor or conveyor, however, presents an individual bearing problem. Only by thorough investigation and adequate study can a proper mounting be designed that will assure unfailing performance under the given operating conditions.

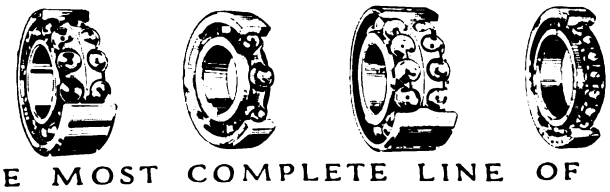
Fafnir Engineers are well qualified, both by training and experience, to solve your bearing problems. Let them help you. Their aid imposes no obligation,—it is merely a fair offer to determine whether Farnir Ball Bearings can secure the same dependable service in your equipment that they are giving in so many other applications.

THE FAFNIR BEARING CO.

Makers of high grade ball bearings—the most complete line of types and sizes in America.

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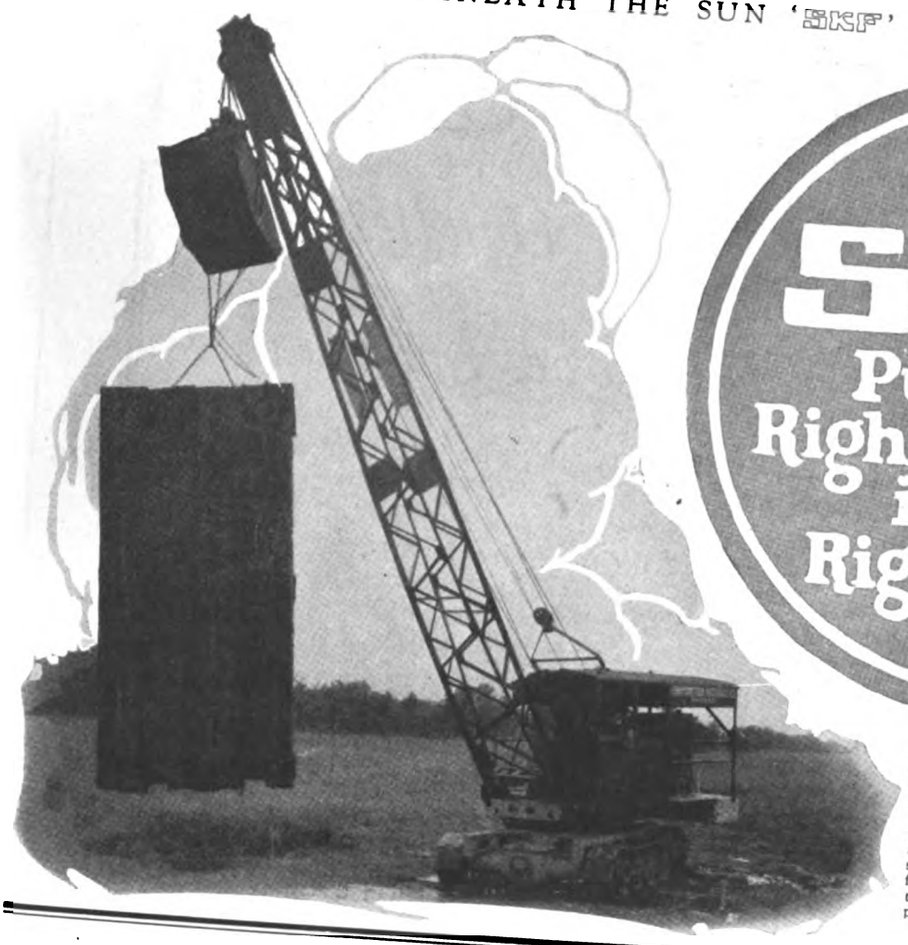
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SKF
Puts the Right Bearing in the Right Place

SKF is linked with a world-wide reputation for delivering satisfactory service, and to an investment too large to be jeopardized by non-performance of anything with which it is connected.
Therefore SKF provides a supervision of factories throughout the world and an international organization for scientific research in engineering, manufacturing and merchandising to assure to the user a full measure of performance in products endorsed with the mark SKF.

Keep Things Moving Easily the Modern Way With Ball Bearing Equipped Material Handling Machinery

IN and about docks and warehouses, in numerous plants of varied industries, you can see the twentieth century way of moving things rapidly, efficiently and at low cost. Industrial trucks, tractors, cranes, elevators, hoists and conveyors, thousands of them in use throughout the world are equipped with SKF-marked Ball Bearings, thus insuring smooth, efficient operation and low power consumption.

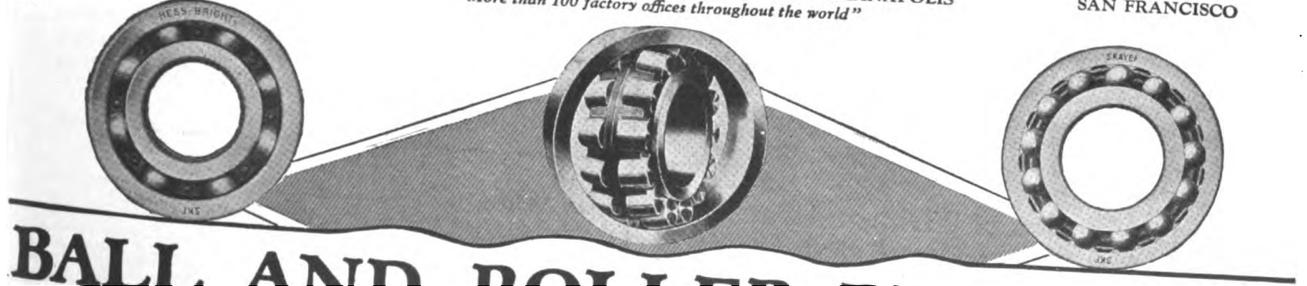
No matter where or how hard the service, SKF-marked Ball Bearings can be depended on, without the troubles incident to plain bearings. Showing little wear after long periods of running, requiring lubricant but two or three times a year and a minimum of maintenance, SKF-marked Ball Bearings possess those qualities which keep material handling machinery on the job twenty-four hours a day if necessary.

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ATLANTA, BOSTON, BUFFALO, CHARLOTTE, CHICAGO, CINCINNATI, CLEVELAND, DALLAS, DETROIT, EL PASO, HARTFORD, INDIANAPOLIS, LOS ANGELES, PHILADELPHIA, SAN FRANCISCO

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For Every Man Who Handles Men

This Book Will Prove Invaluable

HERE is a book that should be in your factory library to be read and absorbed by every executive in your employ who hires, trains or supervises the work of men. It is a veritable storehouse of the most practical and workable methods which have been used successfully by industrial concerns to increase the production of the individual worker. No man can read it without finding his own ideas and thoughts on this all important problem enriched many fold. Pure theory is not a part of its contents. The methods and plans described are the result of the experince not of one man or one concern but of many men in many types of industrial endeavor.

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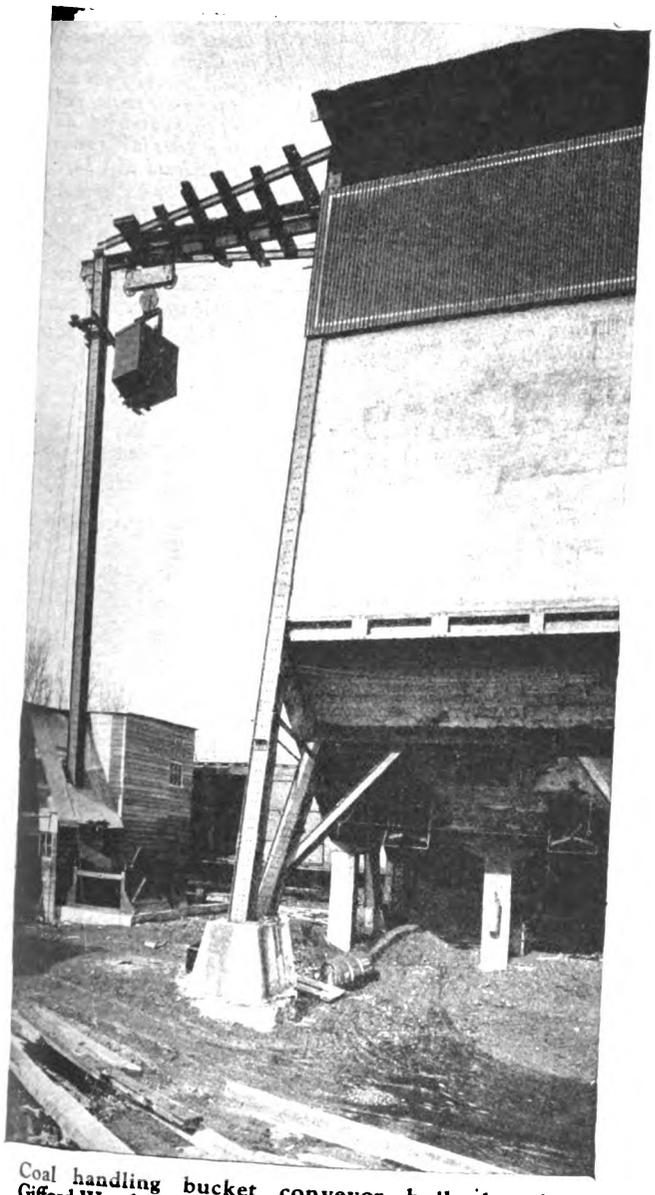
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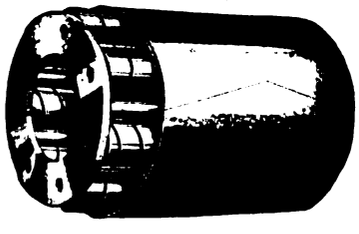
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Smooth, rapid handling of bulk materials
with Hyatt bearing equipment



Coal handling bucket conveyor built by the Gifford-Wood Co., Hudson, New York. Hyatt roller bearings in the trolleys and sheaves insure continuous dependable operation.



111 years of experience, studying and solving bulk material handling problems, have given to the Gifford-Wood Company a knowledge and appreciation of the heavy demands placed on the bearings of such equipment.

That they fully recognize the need for continuous dependability and economy of operation is shown by the selection of Hyatt roller bearings for the trolleys and sheaves of their 3000 lb. trolley bucket conveyor.

With Hyatt bearings there is no sticking or jerky operation. The position of the bucket can be easily and accurately controlled at all times. No adjustment or replacement of the bearings is necessary—oiling three or four times a year is the only attention required.

Enclosed mountings keep foreign matter out of the bearings, provide lubricant reservoirs and prevent the oil from leaking out.

Under the strains of heavy loading, Hyatt bearing equipment can be counted on to give continuous, carefree operation, whether handling coal, ashes, stone, sand, gravel or other bulk materials.

When purchasing material handling equipment of any kind, you can be sure of its easy running and long lasting qualities by specifying Hyatt roller bearings.

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO SAN FRANCISCO
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PITTSBURGH CLEVELAND MILWAUKEE

HYATT ROLLER BEARINGS FOR OVERHEAD HANDLING EQUIPMENT

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Cutting down upkeep on ROOF, on FLOORS, on WALLS

Skilled plant executives do not experiment with unknown products when it comes to maintaining their buildings in good condition. They follow the proved experience of leading industrial concerns—concerns that did their experimenting long ago. Just such experience is embodied in the suggestions below.



At the left is the Famous-Players-Lasky Company's building at Long Island City, New York. Three years ago the outside of this building was painted with Exterior Cemcoat. Though brick and concrete end the life of most paints very quickly as a rule, the Cemcoat has retained its original whiteness and adhered to the walls just as well as other paints do to wood. All the concrete floors in this building are hardened with Lapidolith.



The Campbell Soup Company, Camden, N. J., (at left) has concrete floors that are permanently dustproof, wearproof, and waterproof. The 55,000 square feet of concrete floor surface was treated with Lapidolith, the liquid chemical floor hardener.

The owner of the plant below is saving hundreds of dollars by covering his old roof with Stormtight in place of re-roofing. In the photograph the men are applying semi-liquid Stormtight with brushes. Plastic Stormtight—for sizeable holes, is applied with a trowel.



FLOORS—An ordinary concrete floor in industrial service gives off a fine harsh dust. This dust is breathed into workers' lungs; it settles on machinery, material, and equipment; and is almost as harmful in its effect on them as powdered emery.

Furthermore, this dust is a sign of floor disintegration. Before long it is followed by holes and hollows that necessitate your laying a new floor surface or making repairs. Yet it is a simple matter to fix your concrete floors so they will never dust or wear. A treatment with Lapidolith will make them granite-like in their hardness.

Lapidolith is a liquid chemical that acts on the concrete, hydrating the free lime and changing the coarse structure to a fine-grained crystalline formation that is flint-like. The result is a surface that resists the hardest kind of wear indefinitely. It is acid-resisting. It is waterproof. It is dustproof. The application can be made on either a new or an old concrete floor—overnight, and by morning the floor is ready for business.

If you have wood floors you can prevent them from rotting, splintering, or drying out by an application of Lignophol. This preservative dressing penetrates the wood, restoring its natural oil and gums. It lays the dust and does away with frequent applications of floor oils Lignophol is odorless and non-inflammable. It turns out a floor that is smooth, hard and sanitary, one that stays that way for many years.

PAINTED SURFACES—If you paint walls and ceilings with Cemcoat—the gloss, eggshell, or flat enamel paint—you will have interiors that are not only lastingly bright and cheery, but also easy to keep clean. A Cemcoated surface can be washed again and again; and no matter how dirty the wall may be, the paint comes forth clean and white.

Cemcoat retains this whiteness long after other paints turn yellow. It is resistant to heat and fumes. It usually requires one less coat than other paints because of its body. It adheres to brick or concrete as easily as to wood, for it is not affected by the free lime that is always present in these. Cemcoat is a beautiful, durable, and economical paint, made for exteriors as well as interiors in white and colors.

EXTERIOR WALLS—If you would have warm, dry interiors no matter what the weather, and if you would preserve the natural beauty of your walls, treat the outside of your buildings with Hydrocide Colorless. This material is a perfect waterproofing for brickwork. It penetrates the brick; it contains no paraffin, and so does not run in hot weather; it collects no dust; it can be painted; and, best of all, its presence on a wall cannot be detected.

ROOFS—A small leak or a large leak in the roof of any of your buildings can be lastingly repaired with Stormtight. This adhesive, rubber-like coating can be applied by anyone in a few minutes over any roofing material. At the same time Stormtight will make an entire roof just as waterproof as a single leak. Many an old roof about due for replacement has been made as good as new by an application of Stormtight, thus saving the owner hundreds of dollars. Stormtight is made in semi-liquid and plastic form, and is packed in containers of various sizes.

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Please send me, without any obligation, demonstration sample and literature on:—
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Check those products that interest you most.

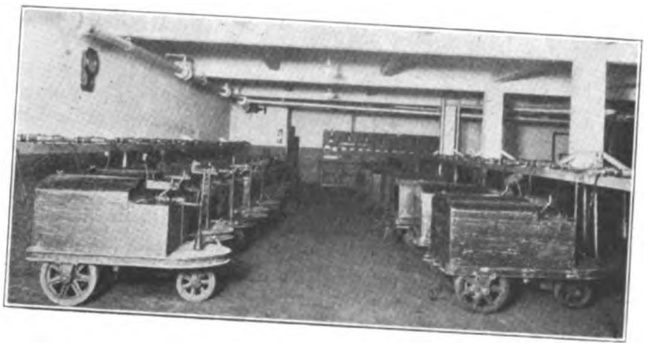
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Maintenance of your Trucks and Tractors

depends largely upon

Proper Charging Equipment

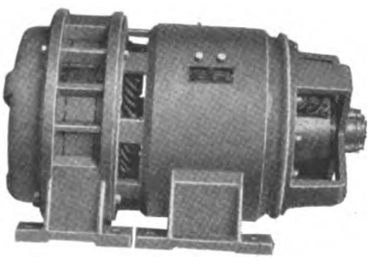


1. It should be conveniently located in your plant—in one or more units as your needs require.
2. It should be designed to have proper capacity to take care of your requirements.
3. It should operate with economy of power and within required charging time.

Make certain that your charging plant is really efficient by consulting our Service Department —entirely without obligation.

A Partial List of Nationally Known Companies using MERCURY Tractors with HERTNER CHARGING EQUIPMENT

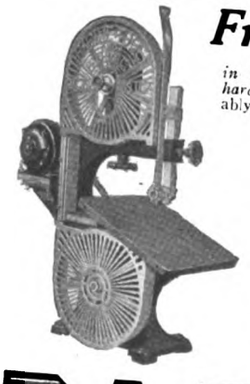
Chesapeake & Ohio Ry. Co.
Chicago Steel Fdy. Co.
Clyde Steamship Co.
Cotton Concentration Co.
Fordyce Lbr. Co.
Holland Furnace Co.
Kewanee Boiler Co.
Northwestern Terminal Co.
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in brass or steel, up to solid bars in soft or hard metals—"Racine" Duplex works dependably in widest range of materials.



2-Speed Transmission provides high speed for wood and soft metals and low speed for steel. *Change speed simply by shifting one lever.* Machine driven by standard electric motor from any light or power circuit. "Racine" is built and finished like fine Machine tools for lifetime use.

Free Chart



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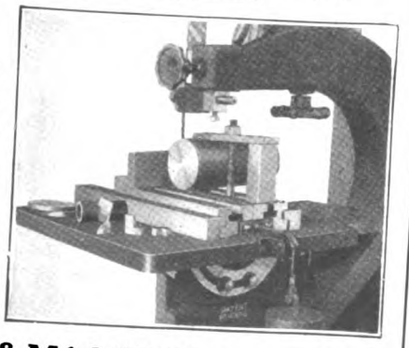
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Use "Racine" Wood and Metal Band Saw Blades and "Racine" H. S. Tungsten Power and Hand Hack Saw Blades.

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Twenty Years' Service and Still giving Satisfaction

Many Maris Hand Cranes have been in service twenty years or more and continue to give satisfaction day after day.

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

A Booklet Describing the New Mitchell Electric Vibrating Screen is being mailed by The C. W. Hunt Company, Inc. See page 83. This screen is used in reclaiming coke from ashes.

Various Applications of the Electric Lift Truck, Tractor and Locomotive Crane is shown on page 111, by the Baker R & L Company.

Booklets on Automatic Temperature Control of Heat in virtually every industry are offered by the Taylor Instrument Companies, page 32.

The Solution to the Conveying, Elevating and Power Transmission Problems described in illustrated catalogs are offered by the Link-Belt Company. See page 88.

A Free Offer During the Warm Weather. Robinson Ventilating Company, page 6. Suggest a means of increasing output and reducing labor turnover wherever heat is used.

Information on Motors Particularly Adapted to Materials Handling Equipment can be obtained from the Star Electric Motor Company, see page 132.

Bulletins Describing the Filtering of Air in Industrial Plants are offered by the Reed Air Filter Company, Inc. Page 5. The latest of these are entitled, "Clean Fuel Air for Oil Engines," and "Reduce the Cost of Free Air."

"Mr. Barber's Scrap Book," contains information on the reduction of handling costs. See page 90. Barber-Greene Company.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 45.

Information on Lighting Fixtures, adjustable for any operation is given in the catalog offered by the American Fixture Company, see page 45.

Handling 137,500 Bricks per Day by means of the electric lift truck is described on page 104 by the Yale & Towne Manufacturing Company.

Catalog and Prices of Sanitary Water Coolers and Bubblers; see page 67, Manufacturers Equipment & Engineering Co.

Motor Service for Materials Handling Machinery is described on page 122 by the Westinghouse Electric Company.

Complete Data on Compressed Air Hoists can be obtained from the Curtis Pneumatic Machinery Company. See page 29.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 50.

Eliminating Dust, Filings, Lint, etc., from Workrooms as a means towards industrial efficiency is described on page 19 by Invincible Vacuum Cleaner Mfg. Co.

How 5,000 American Industries Protect Employees Against Infection is told on page 59 by the Cresog Laboratories Co.

Catalog Describing the New High Lift Electric Tiering Machine and also the low lift is being mailed to those interested by Eleveyor Industrial Truck Corp. Page 76.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move is offered by The American Kron Scale Co. See page 95.

Pneumatic Conveying and Dust Collecting of Fine Particles is described on page 108 by Allen & Billmyre Co., Inc.

Complete Design and Construction of Materials Handling Installations, including conveyors, coal and ash handling machinery, cranes, rope hauling systems, tipples, transfer cars, etc., is a service rendered by Heyl & Patterson, Inc. See page 78.

The New Number 1 Shovel Crane, its features and other advantages, is described in the new catalog just issued by The Brown Hoisting Machinery Co. See page 134.

An Interesting Booklet, "Safeguarding Industry's Greatest Asset: Man," explains an important means of accident prevention. See page 155. Industrial Gloves Corp.

Literature Describing Electric Traveling Cranes, Small Hoists, I-Beam Trolley Switches and Turn Tables can be obtained from Roeper Crane & Hoist Works. See page 100.

End Grain Wood Wheels for Trucks used in industrial handling is described on page 55, by the Metzger Company, Inc.

Cable Reels for Portable Electric Equipment of all Kinds—cranes, dredges, electric magnets, railroad and mining machinery, etc.—described on page 133 by Appleton Electric Company, manufacturers of Reelite.

Catalogs Describing Shop Forges, Drills, Punches, Shears and Bar-Cutters, Exhausters or Combination Wood-Working Machinery can be had by writing to Buffalo Forge Company. See page 47.

Descriptive Literature Showing an Electric Lift Truck that utilizes hand truck platforms is offered by the Wright-Hibbard Industrial Electric Truck Co. Page 118.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 45.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 154.

Electric Locomotives for Every Industrial Haulage Requirement is described on page 124 by the General Electric Co.

The Possibilities of the Electric Tractor in Industry and its costs reducing results is graphically shown on page 178 by General Electric Co.

A Belt Lacer, Extremely Tough, Durable, and Pliant is shown on page 38 by the Clipper Belt Lacer Company.

Bulletins Describing Locomotive Cranes in sizes from 10 to 50 ton capacities, suitable for handling heavy materials from pig iron and scrap to pulp wood and other products should prove of interest to every industrial executive. Can be had by writing The McMyler-Interstate Co. See page 50.

"Hitting the High Spots," is an interesting booklet full of time and money saving suggestions for the tool room and machine shop, particularly in regard to grinding operations. See page, 7, Wisconsin Electric Co.

Handling-Cost-Reducing Air Hoists are shown on page 46 by Northern Engineering Works.

A Catalog Describing Feed Water Regulators, Boiler Feed Pump Governors, Tank Governor's, Steam Reducing Valves. Fulton Mfg. Co. See page 55.

The Elimination of Production Losses through the use of precision ball bearings and roller bearings is part of the service rendered by the engineers of the Norma-Hoffman Bearings Corp. See page 42.

Roller Bearings on Equipment Used for Heavy Handling and its relation to efficient operation. See page 149, Hyatt Roller Bearing Co.

Steel Boxes and Platforms as a Part of a Materials Conveying System is illustrated and described in a catalog issued by the Truscon Steel Company. See coupon page 47.

Industrial Railway Equipment of every description is manufactured by Easton Car & Construction Co. Complete bulletin issued. See page 140.

Counting Machine Operations Automatically has been a decided aid in speeding up production. Durant Mfg. Co. offer a 30-day trial on their speedometer. See page 55.

A Coating that Cuts Heat and Glare of the Sun and results in ideal working conditions. See page 58. The Skybryte Co.

Complete Details and Prices of All Steel Fabricated Buildings can be obtained from Blaw-Knox Company. See page

General Catalog No. 28 contains the complete line of power saving, transmission equipment, sold by the Pyott Foundry Co. See page 63.

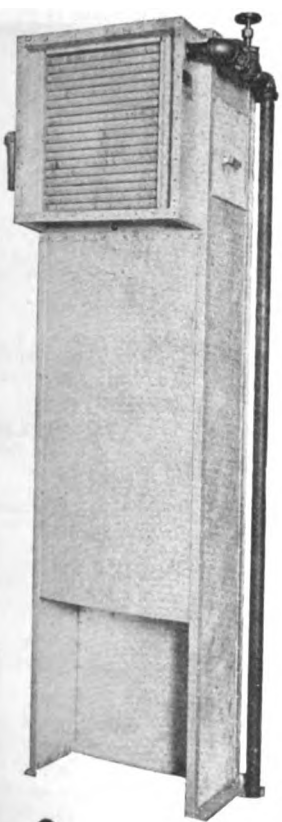
A Metal Cased Broom specially made for heavy duty industrial use is manufactured by The Joseph Lay Co. See page 53.

Fractional Horse Power Motors from 1/40 to 1/4 H.P. are described on page 7. Wisconsin Electric Co. Their ...

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In what Other Heating Method can you get these amazing Advantages?

The Venturafin METHOD OF HEATING



1. More than 5 times the heating efficiency of direct radiation.
2. One-tenth the weight of direct radiation.
3. One-fourth the space of direct radiation.
4. Much less time to install than direct radiation.
5. Positive heat in the most severe weather.
6. Even distribution of heat.
7. The ability to heat up more quickly than direct radiation.
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12. The minimum of maintenance costs.
13. Copper and brass coils, non-corrosive, non-breakable.
14. Portability without great expense.
15. Ventilation as well as heating.
16. No alterations to install.
17. Applicable to practically any heating need without special construction of units.
18. Practically indestructible.
19. Simplicity.
20. Ease of control.

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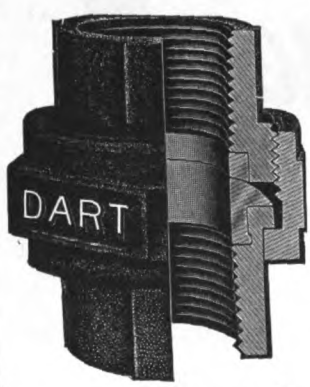
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Wasted Steam—
Wasted Dollars
Stop it with DART Unions

Steam escaping through poorly constructed joints and unions results in higher power costs.

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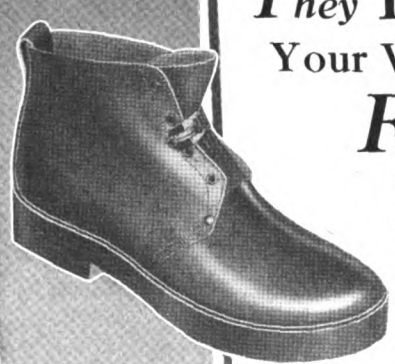
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Illustrated Folder and Prices on steel platforms, boxes, etc., is described on page 61. The Powell Pressed Steel Co.

A Free Sample of a Pencil with a choice of various leads, each adapted to a particular purpose, is offered by the American Lead Pencil Co. See page 53.

An Overhead Trolley System applied to the handling of products to and from japanning ovens. See page 17. Richards-Wilcox Mfg. Co.

Rolling Doors for Industrial Plants, Garages, etc., and approved by Underwriters Laboratories, Inc., is shown on page 42 by Cornell Iron Works, Inc.

Sheet Metal Stampings. The service offered by The Breese Bros. Co. See page 42.

"Elapsed Time Records," is a booklet containing interesting data on time keeping problems. Free on request. The Calculagraph Co. Page 2.

Jenkins Bros. Describe Their Line of Valves in use by many hotels, hospitals, industrial plants and public buildings everywhere. See page 46.

A Catalog and Information on Standardized Steel Buildings ready to erect is offered by Truscon Steel Co. For coupon see page 3.

Details on the Super-Hoist, an unusual chain hoist with many exclusive features is shown on page 61. Wright Mfg. Co.

Various Types and Sizes of Crushers, pulverizers, and shredders are shown on page 86, by the Jeffrey Mfg. Co.

Catalog No. 30 Contains 205 Pages of Gear Information and a great deal of useful data on power transmission. See page 53. W. A. Jones Foundry & Machine Co.

Bulletin No. 74 just issued by the Revolvator Company describes the revolvating feature of this portable tiering machine. See page 120.

A Very Interesting Use of an Auto Truck Scale, in checking weights for bridge tolls is brought out on page 96. Toledo Scale Co.

High Speed Drills for high speed production. See page 57. The Cleveland Twist Drill Co.

Pulleys and Hangars that stand up under the hardest transmission requirements. See page 57. American Pulley Co.

A Portable Belt Conveyor at a remarkably low price is offered by Link Belt Company. See coupon, page 88.

Coatings that Cut Down Upkeep on Roof, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 150.

Catalog No. 10 Describes the Indicating Thermometer useful for various industrial purposes and sold at an exceedingly low price. See page 61. The Motometer Co., Inc.

Bulletins B-1 and B-4 (issued by the Brookville Truck and Tractor Company) describe very low cost methods of haulage. See page 139.

Five very interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 68.

A Condensed Handy Catalog and Price List showing the complete line of Chucks and Arbors is now ready for mailing by The Jacobs Mfg. Co. See page Inside Front Cover.

Circular 1704 of the Westinghouse Electric & Mfg. Co. explains the trouble-free governor on their Steam Turbines. See page 24.

A Remarkable Conveyor Installation in one of the newest metropolitan department stores is shown on page 1 by the Logan Company, formerly The Dow Company. Catalogs can be obtained describing the many types of conveyors they manufacture.

A Choice of 7 Bulletins on the various types of electric hoists and cranes is offered by Shepard Electric Crane & Hoist Company. For any or all of them see Back cover.

The Booklet, "Getting the Drop on Competition" contains some valuable information on saving time and increasing production. See page 64.

The New 1925 Catalog containing 40 pages of interesting data on electric lift trucks and profusely illustrated is now

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ready for mailing by The Elwell-Parker Electric Co. See page 110.

An Opportunity to Try a Container for handling parts, castings, oil drip, waste, etc., in your own plant. See offer page 63, Seamless Steel Products Co.

Three Bulletins on Portable Conveyors, Standard and Boiler House Equipment offered by Robins Conveying Belt Co., page 70.

Sanitation plus Good Appearance is the theme of Sanymetal Products Company advertisement, page 159. Bulletins offered.

Complete Data on the Venturafin Heating Methods can be obtained from American Blower Company, see page 153.

"Coal—the Basic Fuel" shows how your local or nearest mined fuel can be economically burned. See page 40, Stoker Manufacturers Association.

Overhead Cranes and Hoists. See page 151, Maris Brothers, Inc.

Catalog on a Powerful Small Engine for fans, blowers, stokers, etc., can be obtained from Troy Engine & Machine Company. See page 35.

The New K Model Lift Truck with its 7 distinctive features is shown on page 112 by The Stuebing Truck Company.

A Survey on the results of speed reduction units in an industrial plant can be obtained from The Cleveland Worm & Gear Co. See page 144.

The Application of Ball Bearings to Materials Handling Equipment. See page 146. The Fafnir Ball Bearing Co.

"Euclid Utility." A booklet describing the diversified industrial uses of cranes and hoists is offered by The Euclid Crane & Hoist Co. See page 103.

Quantity Weighing with Speed and accuracy. See page 97. Fairbanks Scales.

Bulletins on High Speed Cutting Machines are offered by the Racine Tool & Machine Company. Page 151.

Louden Overhead Book pictures many overhead conveying installations in various industries can be obtained from The Louden Machinery Co. See page 101.

The Advantages of Co-ordination of Parts, Motors and other Accessories for cranes is proven on page 102, Harnischfeger Corporation.

The Construction of the Chain on Yale Chain Blocks is described on page 104, The Yale & Towne Mfg. Co.

The Profits Possible, through the use of the Electric Truck. See page 114, The Yale & Towne Mfg. Co.

Pulling the combined Weight of 14 Men averaging 170 lbs. is a stunt performed by a Mercury Tractor. See page 117, Mercury Manufacturing Company.

A working model of a Portable Tiering Machine is offered by Economy Engineering Company. See page 119.

A New Booklet on Blue Printing describes a machine that prints, washes and dries all in one operation. See page 161, The C. F. Pease Company.

The Application of Ball Bearings to Materials Handling. See page 147, S. K. F. Industries, Incorporated.

Snap Shots of Sensible Savings. A booklet on the tier lift trucking principle. See page 115, The Lakewood Engineering Company.

Form 1874. A booklet on industrial trucking, entitled "Facts for Consideration on Selecting a Battery for Electric Industrial Truck and Tractor Service," is offered by The Electric Storage Battery Company. Page 116.

A Complete Catalog on the I-Beam overhead system of handling is offered by The Cleveland Crane & Engineering Company. Page 98. They are also manufacturers of cranes in all capacities.

Catalog L-14, issued by Reeves Pulley Company illustrates an absolute flexible control of conveying machinery speeds. See page 145.

The Booklet, "Safeguarding Industry's Greatest Asset: Man," is offered by the Industrial Glove Corporation. See page 155.

Information on Sanitary Drinking Fountains, together with prices and specifications can be obtained from Rundle-Spence Mfg. Co. See page 50.

Bulletin 38 describes the bearing assembly of the Century Type SC Motor, the motor especially adapted to materials

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handling machinery. See page 130, Century Electric Company.

A 120-Page Catalog on the choice of adjustable Pipe Hangers. Grinnell Company. Page 18.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 151.

Illustrated Bulletin No. 29 shows a complete Description of the Jennings Pump, its design, construction and method of operation. Page 10. The Nash Engineering Co.

A New Idea in Trucking Wheels for industry. See page 121, The Bassick Company.

High Pressure Lubrication has been adopted by leading manufacturers for thorough lubrication of all machinery. See page 143, Carr Fastener Company.

Booklet X describes a serviceable polyphase motor for hard usage. See page 131, Valley Electric Company.

Latest Literature on Portable Elevators. See page 84, Portable Machinery Co., makers of the Scoop Conveyor.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co. Page 94.

Bulletins on Various Pneumatic Systems in Successful Use are offered by The Dust Recovery and Conveying Co. See pages 105.

The Webster General Catalog No. 48 contains 700 pages of valuable information on cutting handling costs in boiler rooms. See pages 92, The Webster Mfg. Co.

Bulletin I. S.—16 shows many specific examples of the cost cutting possibilities through the use of conveyor. See page 141, The Lamson Company.

Bulletin of a Gasoline Crane for handling coal. See page 136, Koehring Company.

The Economical Utilization of Storage Space is the service offered by Durant Steel Locker Company. See page 20.

A Suggestion for Better, Cheaper Handling of Materials. See Inside Back Cover, Hyatt Roller Bearing Company.

Special Offer on Industrial Trucks. Bert B. Barry. Page 68.

"Rex Chains and Conveyors," is the title of Catalog No. 210. A guide for Chain, Conveying and Transmission Equipment. Offered to engineers, operating men and executives. See page 162, Chain Belt Company.

Hand Book of the U-Re-Lite is a book on protection and safe operation of electrical equipment. See page 8, The Cutter Company.

A Booklet Entitled "Saving from 40% to 60% of Handling Costs," is offered by Cowan Truck Company. Page 113.

Catalog and Performance Bulletin "B," on gasoline Locomotives. See page 138, The Fate-Root-Heath Co.

Industrial Truck and Tractor Bulletin No. 26 contains some pertinent facts on industrial transportation. See page 111, The Baker R & L Company.

Catalog on Metal Buildings. See page 9, Maryland Metal Building Co.

The Belting Book, "Standard Practice for Rubber Belting," can be obtained from Boston Woven Hose & Rubber Co. Page 142.

Catalog No. 98 Offered by Gifford-Wood Co. gives full particulars on eliminating wasteful methods in handling materials. See page 80.

The Advantages of Related Equipment as regards buckets is told on page 87 by The Hayward Company.

General Catalog No. 50, is a 624 page book describing the products of The C. O. Bartlett & Snow Company. See page 82.

The Features to Look for in a Storage Battery. See page 109, Edison Storage Battery Company.

A Country-Wide Service in Industrial Railway Equipment. See page 140, Easton Car & Construction Co.

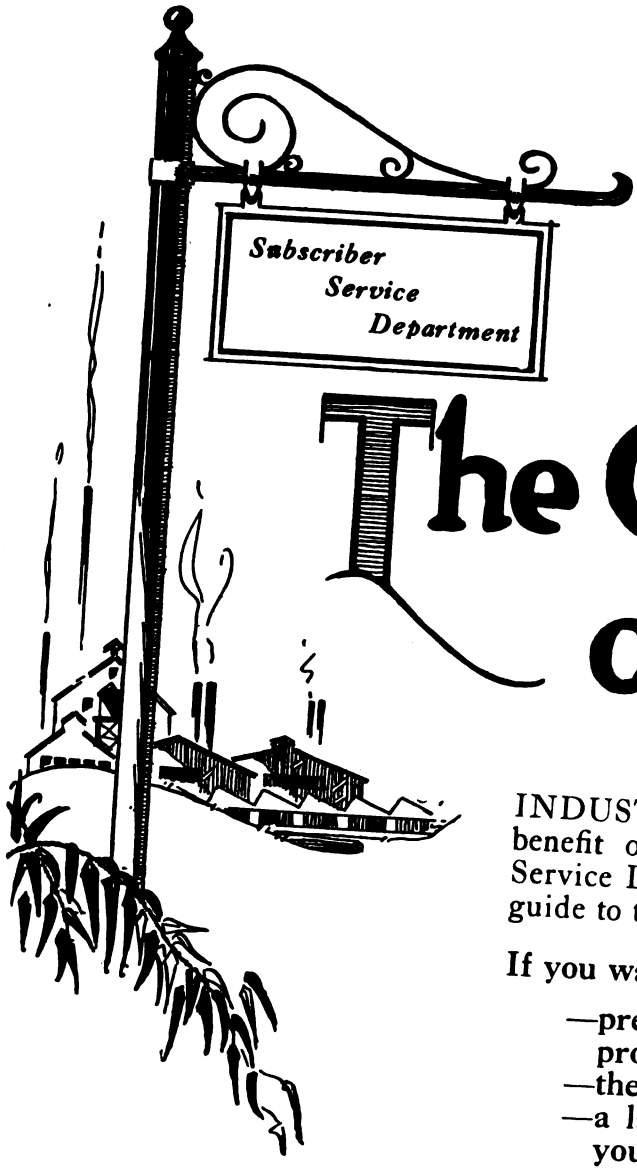
Keeping Dirt and Dust Out of Electrical Equipment is essential to efficient operation. A descriptive folder giving price list of portable electric blowers and testimonials by leading manufacturers is offered by Clements Mfg. Company. Page 68.

Information on Lowered Costs of Oxygen. See page 67, The Keith Dunham Co.

A Folder, "Choosing the Locomotive for the Industrial Plant," can be obtained from Davenport Locomotive Works. See page 137.

An Automatic Conveyor for Every Purpose. See page 91, Chicago Automatic Conveyor Co.

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which are constructed entirely by arc welding, are described in Booklet No. 4657, recently published by the Westinghouse Electric & Mfg. Co., of East Pittsburgh, Pa.

Smokeless Asphalt Kettles and Lead Melting Furnaces

are described in two booklets, Nos. 44 and 48, respectively, which have been published by the Aeroil Burner Co., Inc., 266 Hudson Ave., Union Hill, N. J.

Tructors

Catalog No. 140 illustrating and describing tructors of several types, electric, self-loading, general utility or platform, has been published by The Elwell-Parker Electric Co., Cleveland, Ohio.

Trucks and Dump Trucks

The Autocar Co., Ardmore, Pa., has issued two booklets on these subjects. One contains 104 pages of illustrations and description of Autocar trucks for hauling merchandise and the other sixty-two pages descriptive of Autocar dump trucks.

Leather Belting

The Leather Belting Exchange, Forrest Bldg., Philadelphia, Pa., has issued a non-technical summary of research by the Leather Belting Exchange Foundation of Cornell University, on the applications of leather belting which was written by R. F. Jones.

The Simplex Manual

The 1925 edition of the Manual containing tables and data and information regarding Simplex products has been published by the Simplex Wire & Cable Co., Boston, 9, Mass.

The Vasco System

The Vacuum Ash and Soot Conveyor Co., Wilson Ave., Newark, N. J., has published an illustrated booklet describing the Vasco system of suction conveying apparatus.

Ultra Violet Ray Sterilizers

The application of these sterilizers to swimming pool problems and drinking water supplies is described in two booklets recently issued by the R. U. V. Co., 383 Madison Ave., New York.

Combined Gas and Oil Burner and Mechanical Atomizer and Air Register

This equipment is described in bulletins recently issued by the Peabody Engineering Corp., 110 East 42nd St., New York.

Ball Bearings

This subject is illustrated and described in data sheets which contain shaft and housing bore limits, equivalent tables and other information. A booklet on Maximum Silent Annular Ball Bearings, single row and double row, has also been published by Standard Steel and Bearings, Inc., Plainville, Conn.

"The Story of Edge Gluing"

is the title of a 24-page illustrated booklet which describes the Taylor Clamp Carrier, manufactured by the James L. Taylor Mfg. Co., Poughkeepsie, N. Y.

Jacklift and Stacker Practice

is the subject treated in the annual publication issued by the Lewis-Shepard Co., Boston, Mass. Thirty-three installations are shown including a brief description of each one.

Cleveland Catalog No. 41

Drills, reamers, screw extractors, arbors, mandrels, sockets, mills, counterbores, and other products of the Cleveland Twist Drill Co., of Cleveland, Ohio, are described in this new catalog, which contains 243 pages.

Automatic Plate Valves

Bulletin "D" containing illustrations and description of Mesta automatic plate valves (Iversen patents) has been issued by the Mesta Machine Co., Pittsburgh, Pa.

Hollow Metal Doors and Trim

are described in a book containing eleven sections which include also architectural, builders' and manufacturers' shapes. Another booklet describes Dahlstrom Standard Construction and both are published by the Dahlstrom Metallic Door Co., Jamestown, N. Y.

CO_2 Indicator and Recorder and Zeolite Water Softeners

An illustrated folder describing Ranarex—the mechanical CO_2 Indicator and Recorder, and a booklet containing an outline of the application of Zeolite Water Softeners to the textile industry, have been published by the Permutit Co., of 440 Fourth Ave., New York.

Truck Caster Wheels

A small booklet describing Bassick Ruboid Wheels for eliminating noises has been issued by The Bassick Co., Bridgeport, Conn.

Vises

A 56-page illustrated booklet describing Prentiss Vises has been issued by the Prentiss Vise Co., 110 Lafayette St., New York.

Grab Buckets and Motor Truck Winches, Cranes and Derricks

Catalog 23, descriptive of the Universal Grab Bucket, Type W, and Catalog 25, describing Motor Truck Winches, Cranes and Derricks, have been published by the Mead-Morrison Mfg. Co., East Boston, Mass.

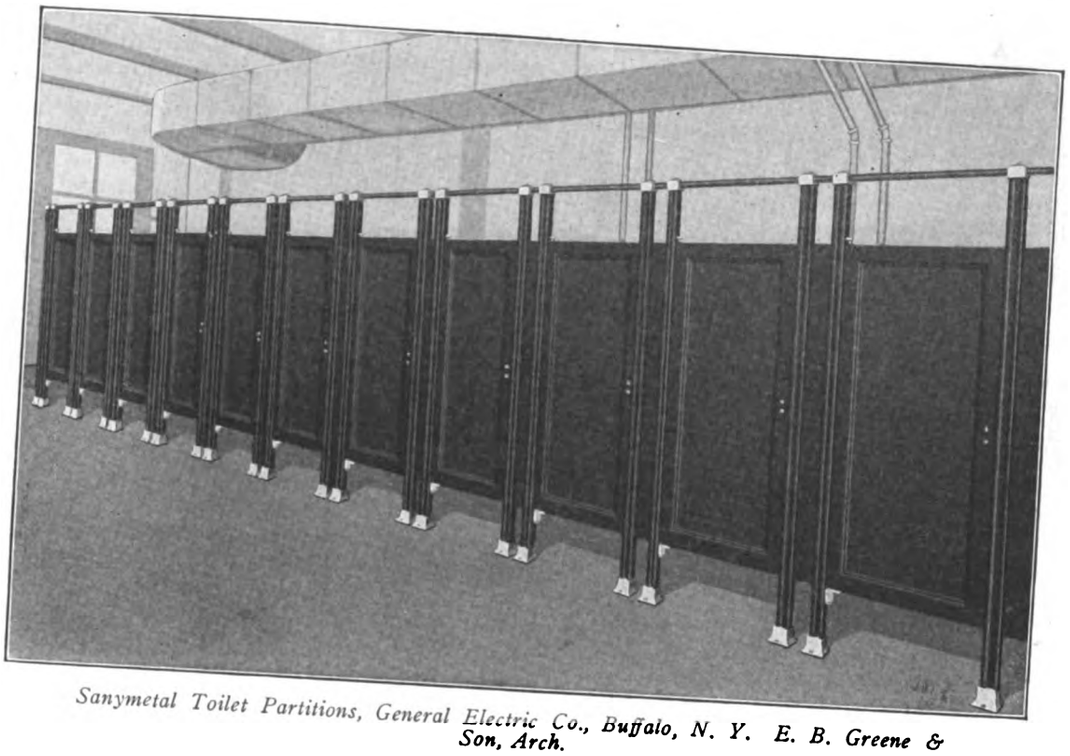
Asphalt Blocks

for bridge and viaduct pavements are described in an illustrated booklet and instructions and remarks on installation are given in another booklet issued by the Hastings Pavement Co., of 25 Broad St., New York.

Creosoted Wood Blocks

Illustrated folders on this subject have been issued by the Compressed Wood Preserving Co., Winton Place, Cincinnati, Ohio.

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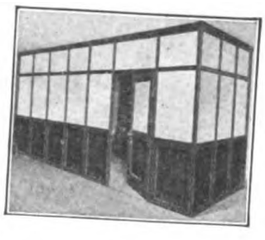
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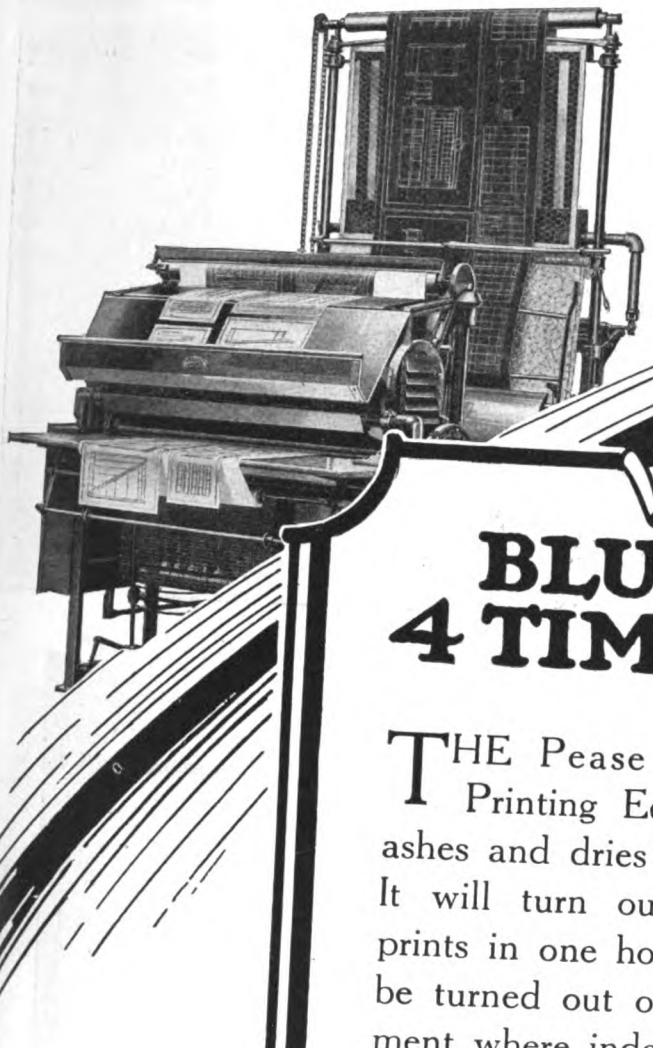
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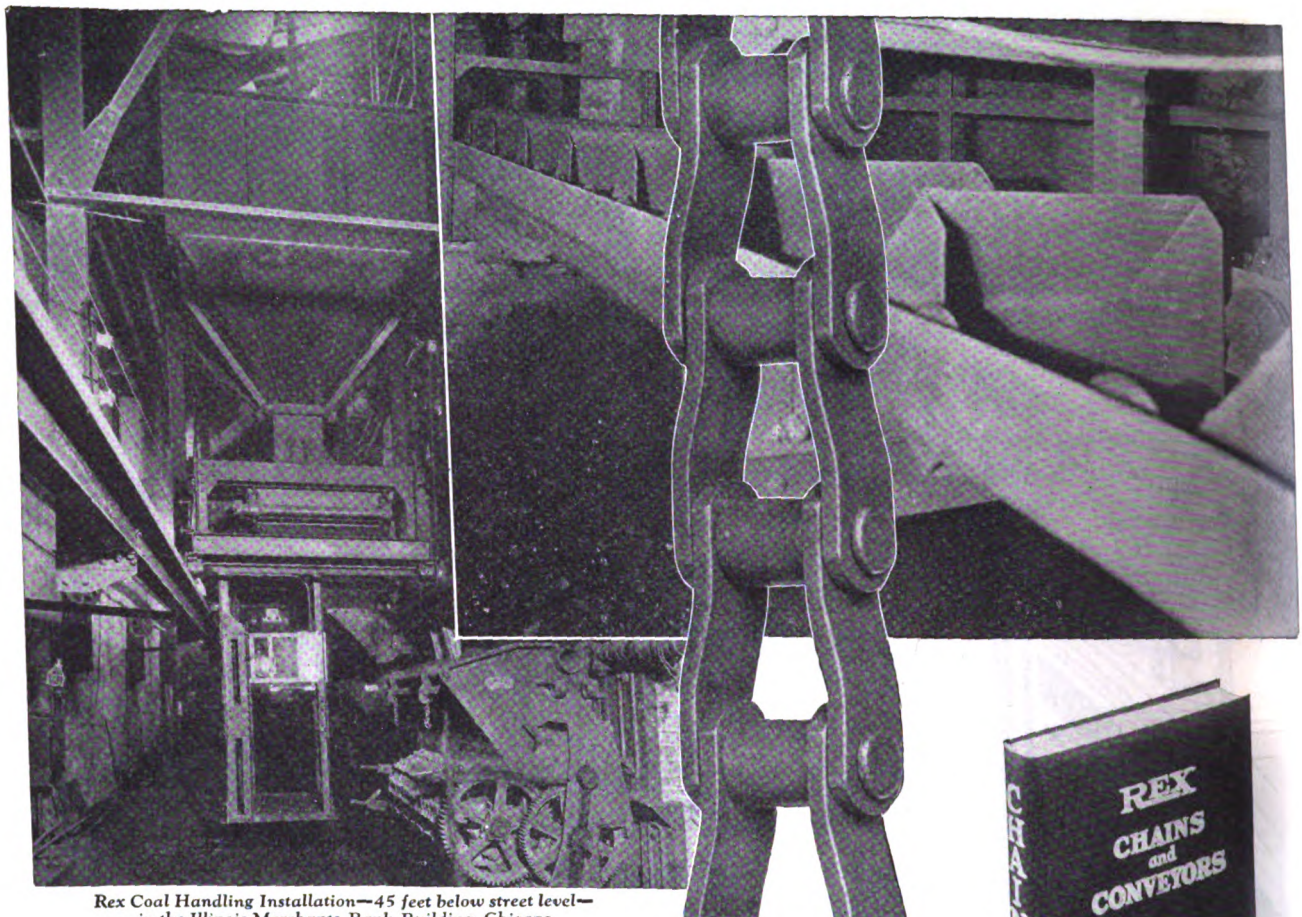
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Almost any method of mechanical handling of coal and ash ought to show a distinct cost advantage over handling the same materials by hand.

This back-breaking job is one that machinery can do better and cheaper than men. Buckets and weigh larries beat scoops and wheelbarrows.

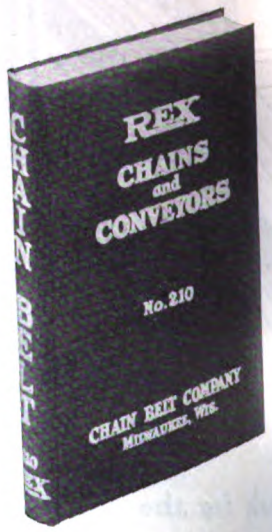
There are at least forty distinct methods of mechanical handling of coal and ash, not mentioning the various combinations of these methods.

Among these forty methods, there is not one that any builder, user, or engineer can say is the best way.

The most any of them could say is, "best for a particular job."

Our engineering and field forces have been trained to work out the coal and ash handling systems that are best for a particular job.

CHAIN BELT COMPANY
711 Park Street, Milwaukee, Wis.



In the Rex 210 Catalog and Engineering Handbook, 117 pages are devoted to coal handling methods, and conveyors. The book covers practically every type of the coal handling machinery that has proven practicable to date.

We have built and installed hundreds of coal handling jobs, and no two of them were ever exactly alike.

We have used at various times many types of coal and ash handling machinery, including Pivoted Bucket Carriers, Beaded Flight Conveyors, Continuous Bucket Elevators, Belt Conveyors, "V" Bucket Elevator Conveyors, Screw Conveyors, Drag Chain Conveyors, Scraper Conveyors, Weigh Larries, Skip Hoists, etc., in combination with a great variety of hoppers, feeders, bins, spouts, etc., for handling all sorts of coal and ashes.

Naturally out of this field of experience we have developed sound basic practices and have found out the conditions that govern the type of conveying to install. Much of this experience is contained in our 210 Catalog; if you haven't a copy, it is free to engineers, plant men and executives.

REX CONVEYORS

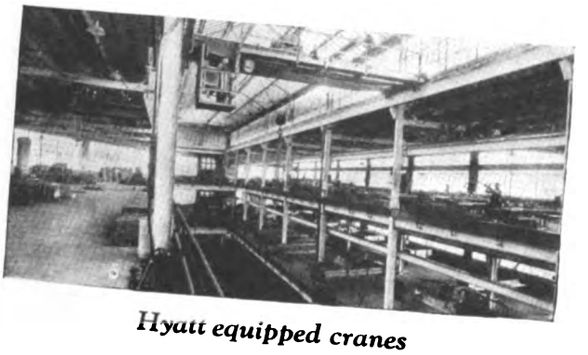
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For better and cheaper handling of materials—



Hyatt equipped trailer trucks



Hyatt equipped cranes



Hyatt equipped conveyors



Hyatt equipped locomotive and cars

Whether the need is for a steady flow of maximum loads or the rapid transfer of varying quantities—quick, dependable delivery, day-in and day-out, is assured when materials are handled by Hyatt bearing equipment.

The following extracts from statements made by users of Hyatt bearing material handling equipment bear witness to its advantages and economies.

Trucks

"Bearings indicated an average saving in draw bar pull to start of nearly 40%, and of about 44% to maintain motion."

Cranes, Trolleys, Hoists

"Hyatt equipped electric hoist saves $75.00 a month and 15 minutes per operation, moving coal from yard to bunkers."

Conveyors

"It was possible to reduce the ply of the belt required from a ten-ply in a large part of the system to a uniform eight-ply throughout the system. This reduced the cost of the belt on the entire installation about $50,000.00, paid for the bearings, and more than justified expectations in regard to reduction in power."

Industrial Locomotives

"Can pull from 3 to 6 more cars than with any other six or seven ton locomotives."

The history of Hyatt bearing material handling equipment is a constant repetition of this story—bigger loads handled more quickly and more easily at less cost.

Whatever your material handling needs, they will be well served by Hyatt bearing equipment. Specify "Hyatt equipped."

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO SAN FRANCISCO
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HYATT ROLLER BEARINGS FOR MATERIAL HANDLING EQUIPMENT

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Four out of the Six plants are using Shepards

FROM the material handling standpoint, this is a valuable issue of Industry Illustrated. The methods in six prominent plants are described. The plant layouts and the goods manufactured are widely diversified.

Electric Hoists play an important part in handling material in four of the six plants. In these four plants there is a predominance of Shepard Equipment.

Chapman Valve uses Shepard Cranes and Shepard Cage Operated Hoists in iron, steel and brass foundries, and in machine shop.

Crompton & Knowles uses Shepard Cage Operated Hoists in cupola raw material room, and Shepard Floor Operated Hoists in other parts of the plant.

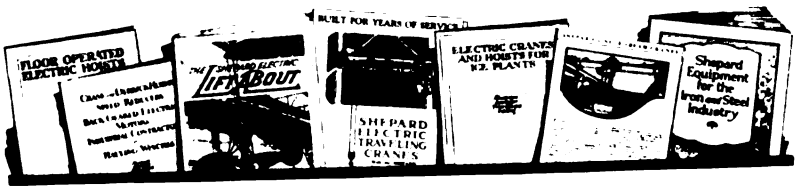
Brown & Sharpe uses Shepard Hoists in milling machine and shipping departments, planer room and foundry. The shipping room also has a 5-ton Shepard Crane.

Westinghouse uses many Shepard Floor Operated Hoists in small motor department and other departments of the plant.

Shepard builds electric cranes, hoists and allied equipment for every type of handling. A complete series of books and bulletins tells the story—please write for any one or all.

SHEPARD ELECTRIC CRANE & HOIST COMPANY
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities

Largest Manufacturer of Electric Hoists in America



HELPFUL BOOKS AND BULLETINS FOR YOU

Shepard will gladly send any or all of the following books or bulletins:

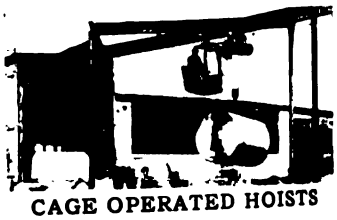
- 60-page Floor Operated Hoist Book. ☐
- 52-page Crane & Derrick Hoist, Back Geared Motor, Speed Reducer and Winch Book. ☐
- 68-page LiftAbout "Book of Illustrated Economies." ☐
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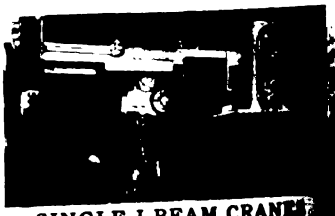
SHEPARD
ELECTRIC CRANES & HOISTS

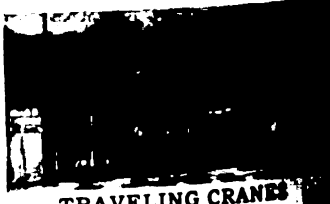
Shepard builds:


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CAGE OPERATED HOISTS


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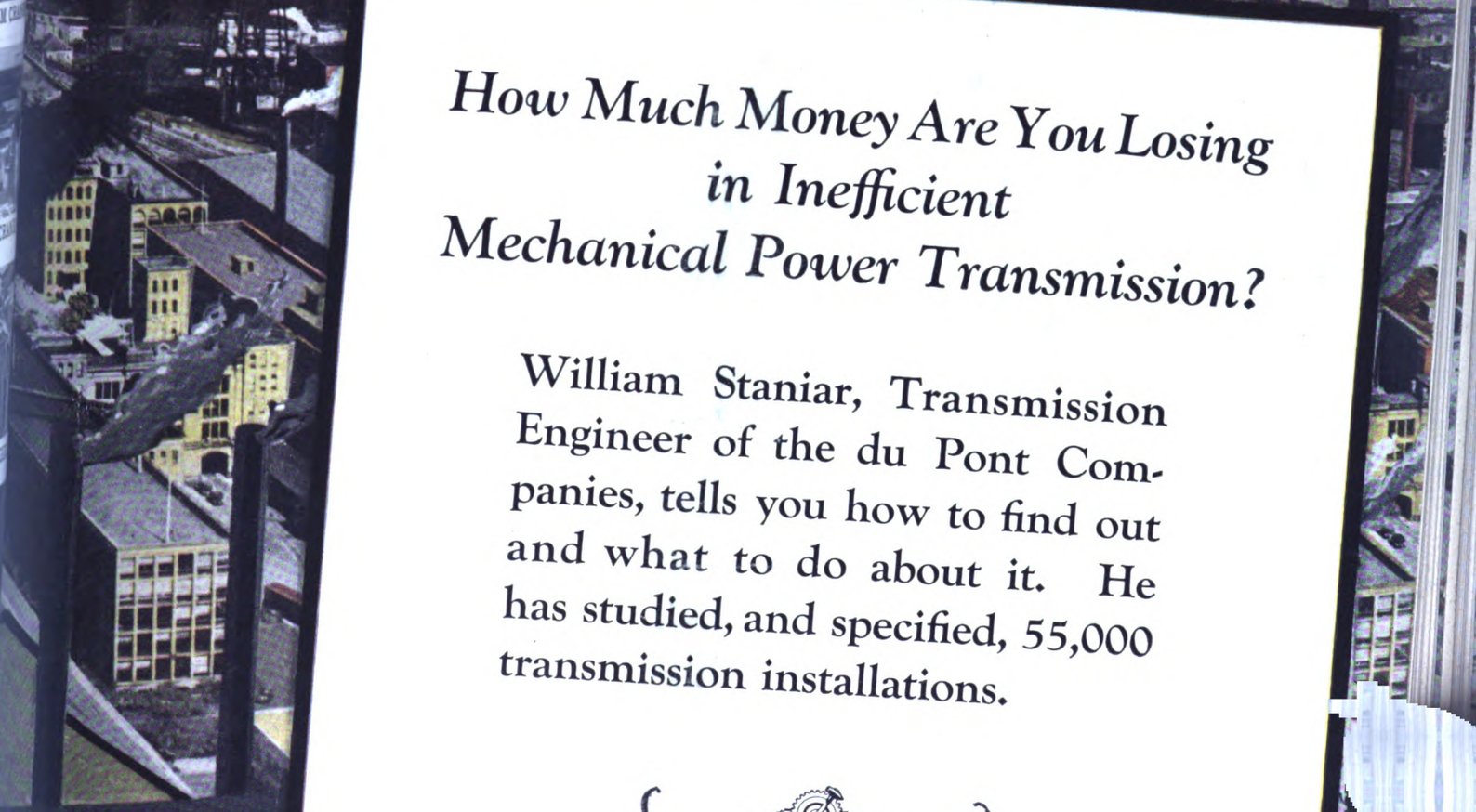
G. & Q. R. R.

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The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures





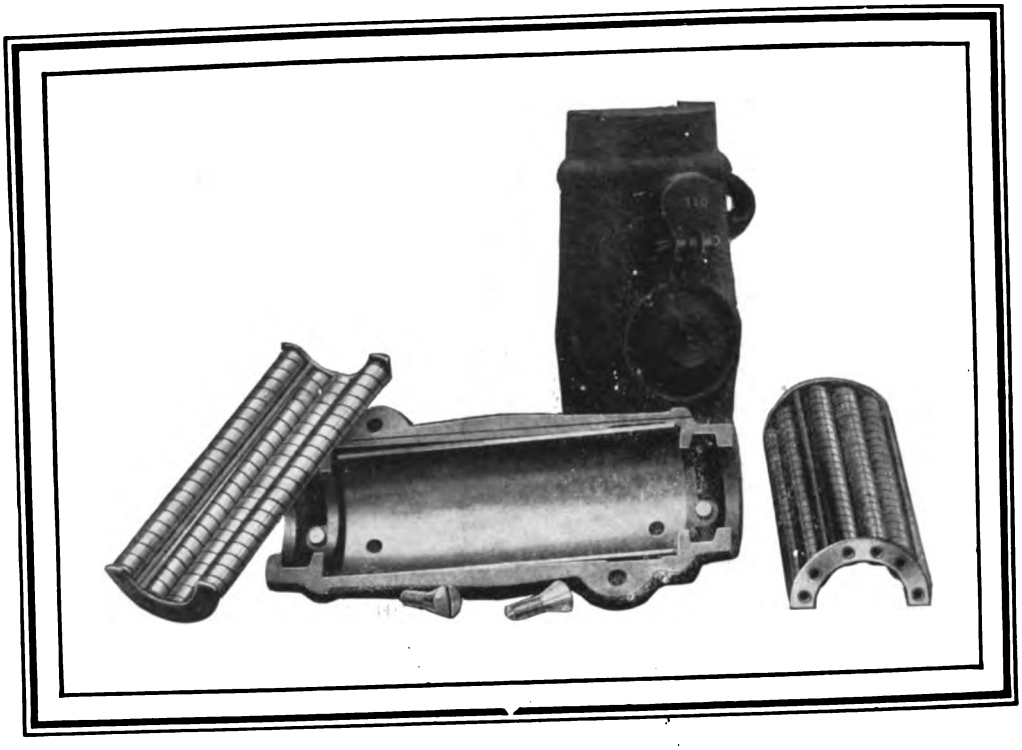
How Much Money Are You Losing in Inefficient Mechanical Power Transmission?

William Staniar, Transmission Engineer of the du Pont Companies, tells you how to find out and what to do about it. He has studied, and specified, 55,000 transmission installations.

Complete Table of Contents, page 11

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4 LINCOLN'S INN FIELDS, LONDON W.C.

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When two halves are better than a whole

TWO halves equal a whole but there are times when two halves are decidedly better than a whole—for instance when installing or changing line shaft bearings.

Because Hyatt line shaft roller bearings are split they can be applied to shafting at any time without disturbing pulleys, couplings or other equipment.

A wrench—a screw driver—a stepladder. With these simple aids any millwright can install Hyatt bearings in your present frames. A ten minute job for each bearing.

Once installed, Hyatt bearings require no attention of any kind except oiling three or four times a year. Bearings installed thirty-four years ago are giving the same satisfactory service today as in 1891.

Hyatt bearings pay for themselves in less than two years through the savings they effect in power, lubrication and maintenance. After that these savings are clear profit.

Typical of the results obtained by the users of over 1,500,000 Hyatt line shaft bearings is the experience of the Oliver Chilled Plow Works, South Bend, Indiana, who report:

"We have used Hyatt line shaft bearings here quite extensively since 1914. Our experience has made us feel justified in equipping all new departments with them; in fact our new factory is Hyatt equipped throughout".

It will pay you to look into the advantages offered by Hyatt bearings. Consult your local mill supply dealer.

Full information on Hyatt line shaft bearings is contained in Bulletin No. 130. A copy is yours for the asking.

HYATT ROLLER BEARING COMPANY
NEWARK, NEW JERSEY
PACIFIC COAST ADDRESS: SAN FRANCISCO, CAL.

HYATT ROLLER BEARINGS FOR LINE SHAFTING

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SQUIBB-another user



Boxes containing Squibb's pharmaceuticals are filled while on the conveyors and moved mechanically hundreds of feet through various departments to shipping room via Dow Belt Conveyors, Dow Gravity Rollers, Dow Chutes and Dow Slat Conveyors.

GOOD health to you and your business! Through strict, ethical standards of practice, E. R. Squibb and Sons, chemists to the medical and dental professions since 1858, have developed an enviable reputation for dependability of products. And rightly so, for human health is not to be tampered with. It is also apparent that, by their use of Dow Conveyors, this long-established company has a justifiable respect for the health of its business. For Dow Conveyors, by eliminating waste of time, labor and money, stimulate growth and safeguard resources.



Squibb's Dental Cream (made with Squibb's Milk of Magnesia), Squibb's Epsom Salts, Squibb's Castor Oil (tasteless), Squibb's Bicarbonate of Soda and many other dependable Squibb products are each day protecting personal health. And each day Dow Conveyors, adapted to the requirements of individual businesses, are safeguarding the health of industry in general. Ask our nearest office for further details.

Logan Co.

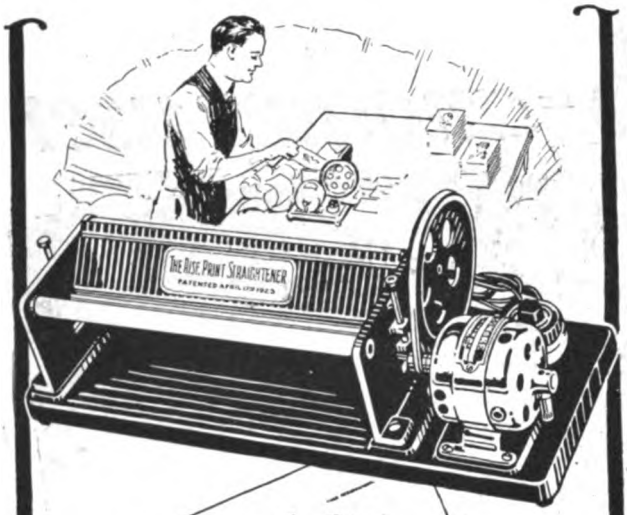
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Type D
1/8 h.p. Cast iron frame. Enamel finish. Plain bearings, grease cups. Operates on A.C. or D.C.



No. 3GM—Stripped
1/4 h.p. Aluminum frame. Enamel finish. Norma bearings, ventilated. Operates on A.C. or D.C.



Type A—Stripped
1/3 h.p. Cast iron frame. Enamel finish. Babbitt bearings, wick oil feed. Operates on A.C. or D.C.



Type SAX
1/8 h.p. motor with special base. Nickel plated. Operates on A.C. or D.C.

Dependable

"We can depend on the little Dumore," says C. H. Rise, manufacturer of the Rise Print Straightener.

Wherever smooth, quiet, *dependable* power is needed—there you will find Dumore fractional horse-power motors.

Perhaps you have a manufacturing problem that involves the use of small motors. If so, let one of our experts talk it over with you. We've helped hundreds of other manufacturers—maybe we can help you.

Wisconsin Electric Company
70 Sixteenth Street, Racine, Wis.

DUMORE
Fractional H.P. Motors

The Publisher's Column

It is a complicated job to run a factory or even one factory department successfully. As one plant manager eloquently expresses the thought, "It's just one thing after another!" In a nutshell that is the whole secret of successfully doing things. It is the constant drive, day after day, week after week, plugging just one leak after another that brings the annual profit statement out in black ink instead of red.

Dollars are made round, it is said, so that they can roll away easily. Profit dollars have an unusually nimble faculty of getting away and losing themselves in one of several hundred unexpected places.

Every month, in the pages of this publication, it is our purpose to point out to factory executives some of the places where profit dollars are likely to escape, and how to plug up these traps or cracks so that future escape will be unlikely.

In this issue, in particular, attention is called to profit losses through mechanical power transmission leaks.

It's a safe statement that many thousands of your own dollars have disappeared through this exit.

It's also a safe statement that if you will read and follow William Staniar's articles on this subject, which begin in this issue, very few of your profit dollars will escape in this direction in the future.

Industry Illustrated

Published Monthly by

THE ENGINEERING MAGAZINE CO.

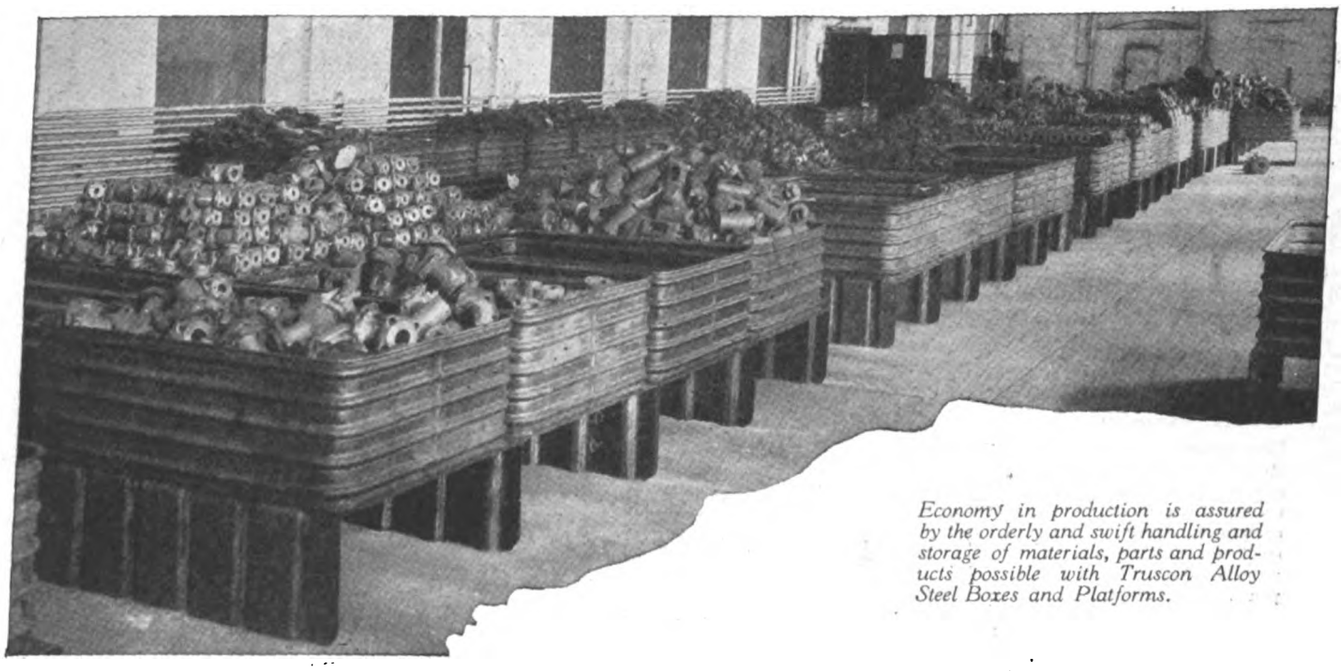
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Economy in production is assured by the orderly and swift handling and storage of materials, parts and products possible with Truscon Alloy Steel Boxes and Platforms.

Truscon Handling Equipment For Efficiency and Economy

You want handling equipment in your plant that will help keep men and machines at full productive capacity. Truscon has designed special Alloy Steel Boxes and Platforms to solve that very problem. They are adaptable to the type of conveyor you are using. Let us tell you full details of their durability and economy.

Return the coupon for catalog and information.

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TRUSCON ALLOY STEEL BOXES AND PLATFORMS

Truscon Alloy Steel Boxes and Platforms adapt themselves to every type of conveyor. Lugs and trunnions may be provided for crane handling. The Truscon Platform meets completely the lift-truck problem.

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Send me catalog and full information on Truscon Alloy Steel Boxes and Platforms.

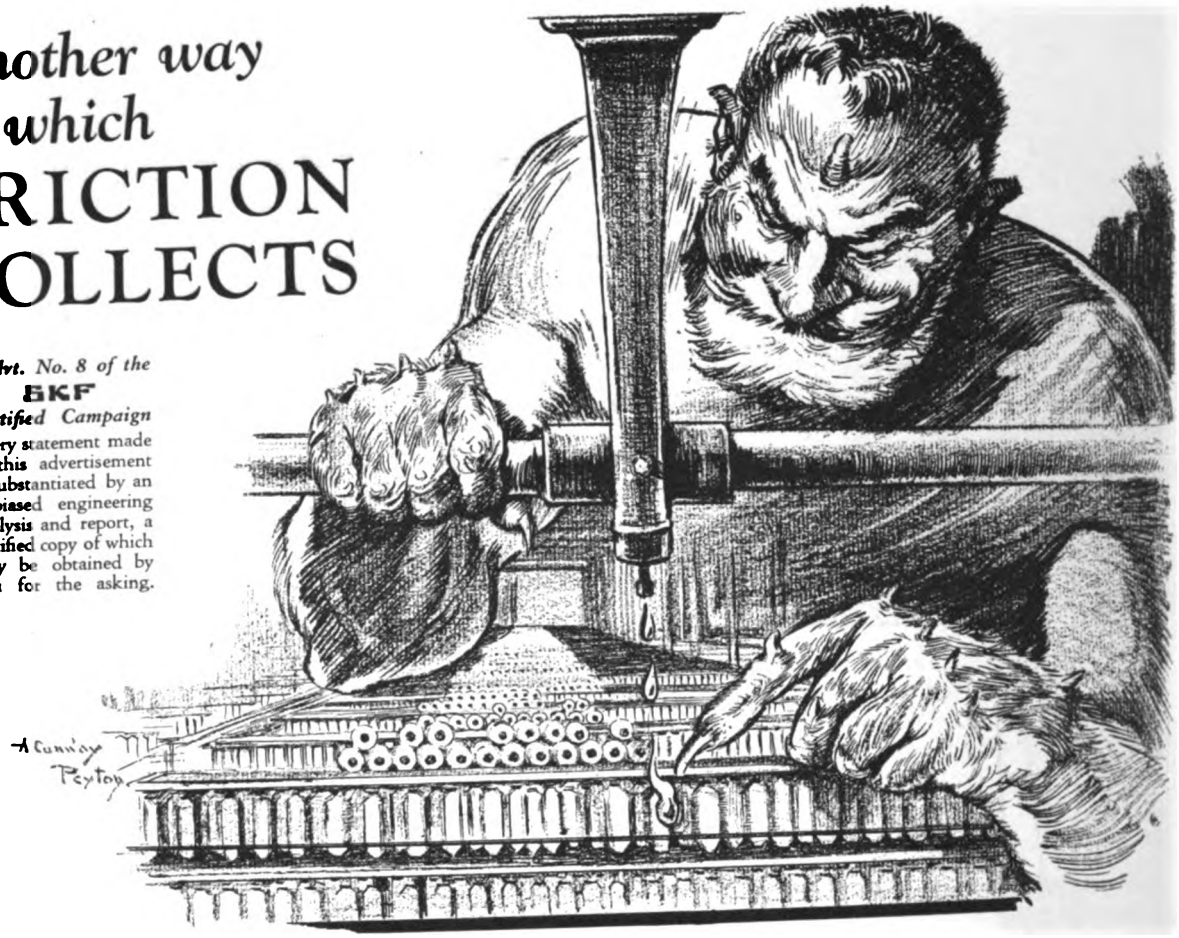
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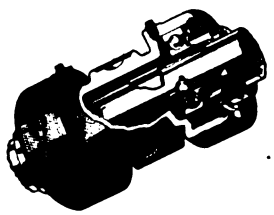
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Another way in which FRICTION COLLECTS

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Every statement made in this advertisement is substantiated by an unbiased engineering analysis and report, a certified copy of which may be obtained by you for the asking.



"SPOILAGE" *by dripping oil*



Not Self-Aligning



Self-Aligning

WHEN plain bearings run hot and drip oil as a leaky faucet drips water, friction is using a double-barrelled gun in its attack on the efficiency of your plant.

A Pennsylvania weaver of heavy fabrics discovered this some time ago. Not only did plain bearings on line shafting cause a regular yearly waste of more than $1,100 in power, lubrication and labor costs, but they were causing a far more serious waste because of the spoilage of valuable merchandise by dripping oil.*

Then SKAYEF Self-Aligning Ball Bearing Hanger equipment was installed! The bearings, in oil-tight casings, eliminated the dripping of oil entirely. They required oiling only once or twice a year. They reduced friction to an absolute minimum. They lowered power, lubrication and labor costs to such an extent that they provided a return, the first year of 49% on the cost of the Skayef installation! They paid for themselves in about two years.

It would pay you to put your bearing problems up to SKF *now*.

*A certified report on the situation free upon request.

The Skayef Ball Bearing Company, 165 Broadway, New York

1424

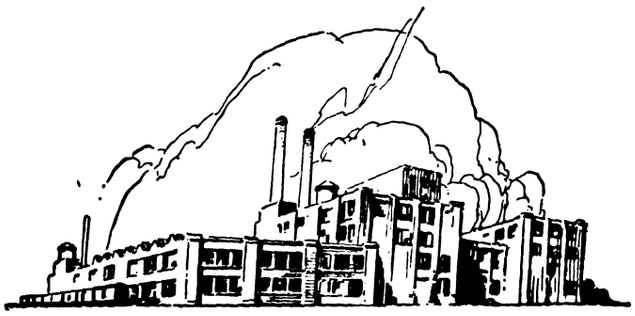
BALL BEARING

SKAYEF HANGERS

POST, HANGERS, PILLOW BLOCKS SKF **AND TRANSMISSION APPLIANCES**

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This Plant Had a Yard That Ate Profits

TEN years ago this plant was finished. It had a mahogany finished director's room and shower baths for the executives. And it made a lot of money.

Then 1925

came along. Its highly competitive market sent selling costs sky high. So the board of directors went into conference. "We've got to sell," said they, "we've got to sell at any price. Production costs must be cut."

Memorandums went out. The fellows who got things done around the plant set out to snip pennies, nickels and dimes from operating and production costs. When a fellow lopped off a cent he was greeted with "Hail the Conquering Hero Comes."

The cost

of producing an article that sold for about a dollar was reduced by three cents. But, the directors kept singing, "We've got to have lower production costs to make money." Yet no one could find another cent to clip.

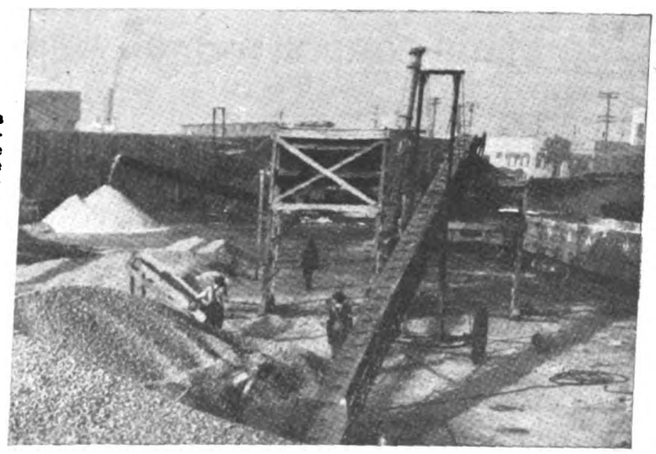
Perhaps one reason for this was that no one thought of looking at the big yard that was laid out around the plant. For, one day the plant engineer noticed ten husky fellows shoveling and wheeling coal out there. Those fellows could have been doing more productive work somewhere else.

So the plant engineer

went hot foot to the plant manager's office. There was a long conference interspersed with frequent references to the pages of Industrial Management.

Now there are two men working in the yard and they are handling the coal and other materials faster than ever. But the two men are unloading and storing with two Barber-Greene "N" Portable Conveyors. The frequent demurrage charges that used to "just happen" don't "just happen" any more.

Eight men have been put to more productive work. One cent more per unit has been clipped from production costs—and that means one cent more of profit.



This picture illustrates the versatility of Barber-Greene "N" Portable Conveyors. Here you see several of them—conveying to bins—unloading cars — building stockpiles for the Tampa Coal Company. How Barber-Greenes handle a multitude of different jobs, similar to these, at a profit is shown by text, pictures and diagrams in our "Mr. Barber's Scrapbook." Send for a copy.

BARBER-GREENE CO. 500 W. Park Av., Aurora, Ill.
Representatives in Fifty Cities

BARBER GREENE

Portable Belt Conveyors Self Feeding Bucket Loaders
Coal Loaders . . . . . Automatic Ditch Diggers . . . . . Coal Feeders

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Pays Cost & Operation Charges ~ in One and a Half Years



WITHIN a year-and-a-half, the increased production, speeded up by the McCaskey System, paid for the cost and operation of this System in the Fulton Iron Works at St. Louis, Missouri.

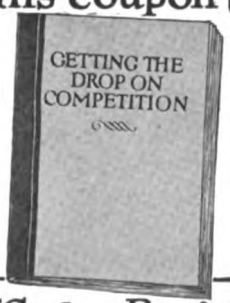
The Works Manager, E. G. Bailey, is enthusiastic about wonders done by the McCaskey System in the plant.

"Before we installed the McCaskey," said Mr. Bailey, "we had no accurate check on production. We never had any certain knowledge of work in progress. Parts needed first were generally finished last. Production was continually held up.

"It's different since we installed our McCaskey System. Accurate records of all work are always before us. Parts are finished. Required order and production speeded throughout the plant. The McCaskey System has paid for itself and the cost of its operation."

Mr. Bailey's testimony is the same as many hundreds of other enthusiastic McCaskey users. They know what McCaskey has accomplished and can accomplish in industry. We'll be glad to show you how and where it can be applied to your business.

Mail this coupon today



The McCaskey Register Co.
Alliance ~ Ohio

Your booklet "Getting the Drop on Competition" might help me. Please send me a Free copy without any obligation to me.

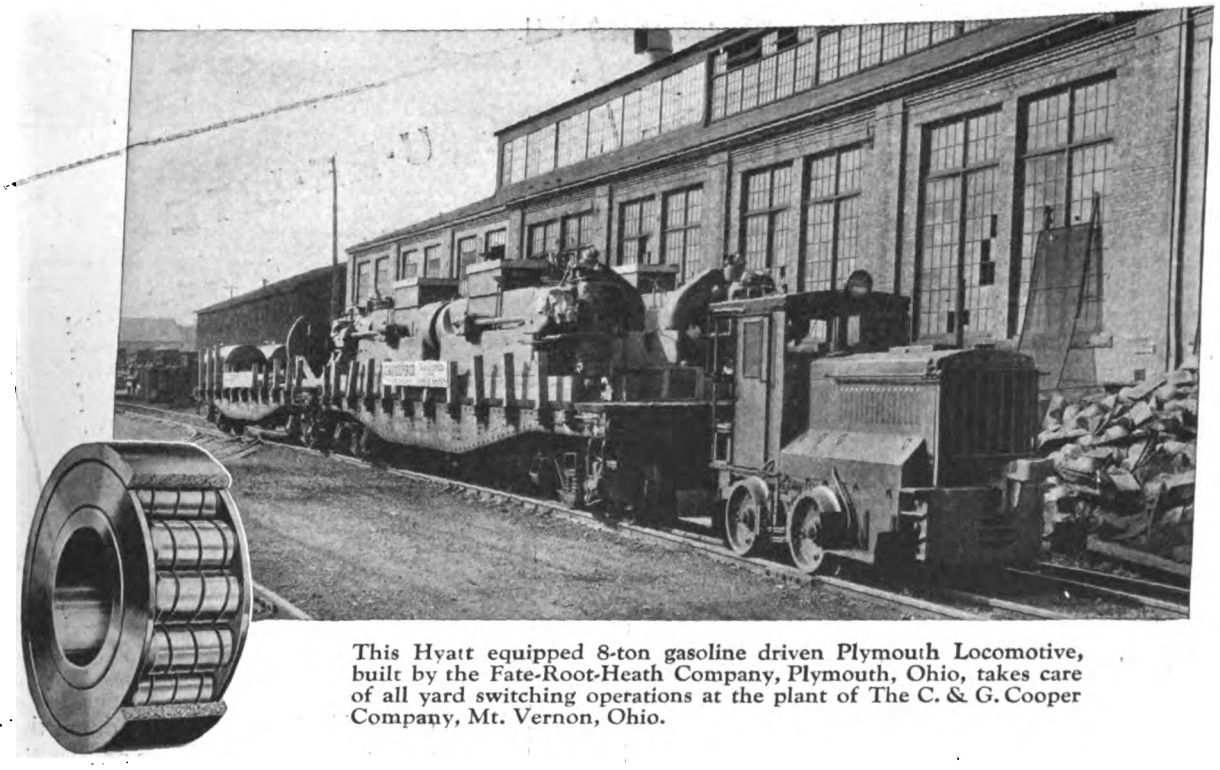
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THE MCCASKEY REGISTER CO.
Industrial Division

Alliance, Ohio McCASKEY ONE WRITING SYSTEMS **Galt, Canada**

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This Hyatt equipped 8-ton gasoline driven Plymouth Locomotive, built by the Fate-Root-Heath Company, Plymouth, Ohio, takes care of all yard switching operations at the plant of The C. & G. Cooper Company, Mt. Vernon, Ohio.

Giants for performance—

Midgets for expense

THAT is the record of Plymouth Locomotives built by the Fate-Root-Heath Company—a record to which Hyatt roller bearings have contributed an important part.

These modern bearings in the axle boxes serve as a means both to easy running and long life. Their true rolling motion, positive lubrication and built-in strength effectively meet the exacting demands of industrial locomotive service.

Hyatt bearings operate year-in and year-out without adjustments, repairs or replacements. All the attention they require is a shot of oil once every three or four months.

They are the logical bearings for the busy plant where uninterrupted operation of equipment is essential. Specify them when installing locomotives and other transportation and handling equipment.

HYATT ROLLER BEARING COMPANY
NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA CHARLOTTE
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HYATT ROLLER BEARINGS FOR ALL INDUSTRIAL EQUIPMENT

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U·RE·LITE

U-Re-Lite is not an ordinary safety switch or circuit breaker. It is The I-T-E Circuit Breaker in the specially constructed steel box. It is the *only* absolute protection against overloads, short circuits, and damaged electrical equipment. It is built by manufacturers who, for 36 years, have held the reputation of pioneers and leaders in electrical protective devices.

Cutter Engineers have set down their most valuable knowledge on Electrical Protection—based on 36 years of wide engineering experience—into a fully illustrated, bound Handbook that every industrial executive and plant engineer should have in his possession. It is yours for the asking.

* * *

Safeguarding Electrical Equipment

To every industry in the world that uses electricity and electrical machinery, U-Re-Lite is a vital asset for the savings and protection it affords.

The most reliable insurance against loss of time, interrupted production and damage to valuable electrical equipment is

U·RE·LITE

U-Re-Lite is primarily a device that protects electric motors, lighting and power circuits from overloads and *short circuits*. It is an electric safety valve. An overload trips it open; a twist of the handle ON THE FRONT of the box restores service. Do not confuse it with ordinary circuit breakers—U-Re-Lite is *The I-T-E Circuit Breaker in the Steel Box*; sturdily built, rugged in design, Cutter-made, Cutter-guaranteed.

U-Re-Lite, once set and *locked* by the man in charge, cannot be tampered with. It will break a current at least 100 times as great as its rated capacity. U-Re-Lite has been fully tested and approved by the Underwriters' Laboratory for use without any fuses in the circuit it protects. Its range of sizes makes it adaptable to practically every size of motor in the average plant.

1. U-Re-Lite is absolutely fool-proof. Once closed, it stays closed until the exact current value trips it open.

2. U-Re-Lite is built to last. Its mechanical construction is perfect. Cost for repairs is negligible, if any.

3. U-Re-Lite has been passed by the Underwriters' Laboratories for use *without fuses* of any kind in the circuit.

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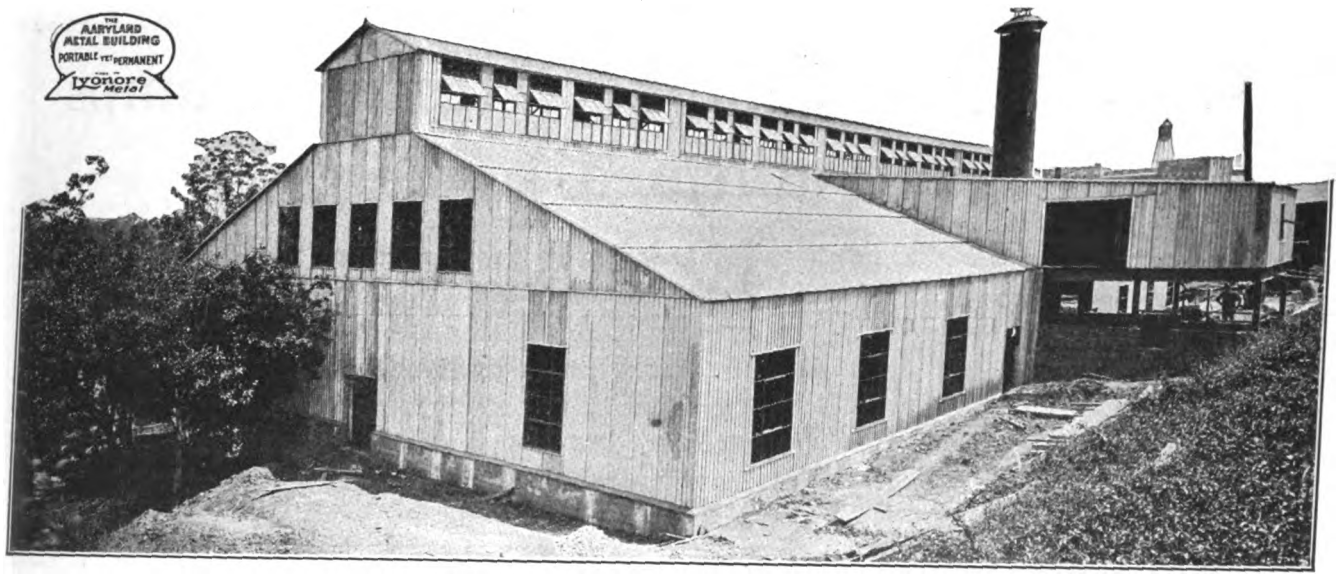
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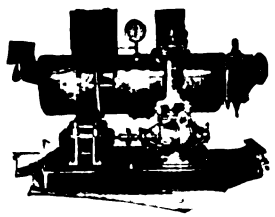
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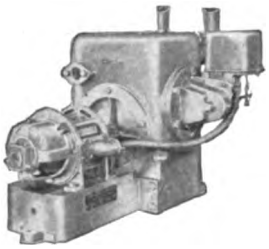
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SEPTEMBER, 1925

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES, MATTHEW W. POTTS } *Associate Editors*

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WHAT do you know about work benches? Perhaps you know more than the average man who has them in his factory. We found that this average man really knew very little about the how's, why's and wherefore's of the homely and ever-present work bench.

Yet there are many things which should be known about the work bench by people who have work done upon them. When you consider the vast amount of manufactured product that passes over America's work benches, isn't it true that we should give these useful appliances some intelligent study?

This is only one of the many articles of immediate practical value which will be found in the splendid October number of INDUSTRY ILLUSTRATED.

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The Control of Mechanical Power Transmission

Millions of Dollars are Annually Wasted Through Inefficient Transmission

By William Staniar*

Belting and Transmission Engineer, E. I. du Pont de Nemours & Co.

THE power chain from the mechanical generation of power to its mechanical application is composed of three links—Steam, Electric and Mechanical. The mechanical, or final, link is generally the weakest in the average manufacturing plant today, because it receives the least attention during design and after installation.

The importance of this final link in the power chain is now being realized because research work has demonstrated that it can be made just as efficient as the other two, if proper attention is given to its design and proper supervision to its installation and operation.

Executives and plant managers have no idea, for example, of the actual waste of money and lowered production efficiency caused by the improper selection of power belting as to type, width and thickness and the misapplication of transmission appurtenances.

A belt driven production machine, any belt driven apparatus, is only producing efficiently just so long as its belt is running efficiently, and it cannot do that unless it is of the proper type for the surrounding atmospheric conditions and the proper width and thickness for the pulley design, speed and the power to be transmitted.

It is a fact of experience, and one that has always been difficult to understand, that a majority of executives and managers have always and still do, underestimate the vital importance of their power belting. They demand expert engineering skill for the production of their power and the selection of apparatus, always with the idea of maximum production at minimum cost, but when it comes to belting, the most widely used and indispensable link between that power and maximum production, they place the responsibility for its selection, design, installation and care upon untrained men who use old rule-of-thumb methods, their own limited belting experience and consideration of first cost only. This condition caused the ninety thousand dollar a year expenditure cited under the picture on this page, because it resulted in poorly designed drives, loss of power and depreciation of belting and transmission equipment, which together constitute a heavy and unnecessary percentage of production costs.

There is no doubt that the apparent lack of interest on the part of executives in this important matter is their failure to realize its vital importance

To find out whether you can save money on your belt transmission, ask yourself these questions:

1—What is our annual expenditure for new belting?
2—What is our annual belting maintenance cost?
3—How many belt repair men do we employ?
4—Who prescribes the belting we buy—the Purchasing Department or an experienced engineer?
5—Who determines the particular belt as to type, width and thickness for the particular drive—millwrights or an experienced engineer?
6—Have we any system for belting control—or is it just a hit-or-miss proposition?
7—What types of belting are we using and why?
8—Do we really know anything about the leather belting we are buying?
9—Do we buy leather belting on specification? If so, are our purchases checked and by whom?
10—What controls our leather belting purchases—quality or discount?
11—Have we investigated the possibility of substituting leather with rubber, hair, balata or canvas belting for some installations?
12—Do we pay any particular attention to the methods of joining our belting?



Fig. 1. "Mr. Executive, what is your annual expenditure for belting?" "I haven't the slightest idea." It was found to be $90,000 per year, or six per cent. on an investment of one and one-half million dollars. Ignorance of actual belting costs is the rule in seventy-five per cent. of our big manufacturing plants.

*See page 61.

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and the possible losses involved. Therefore, it is the desire of the writer in this series of articles on belting and mechanical power transmission to create a picture in the minds of these men as to what may be going on in their plants and what may be done to stop the continuation of the waste.

It is the problem of the writer to keep these costs down to a minimum, to increase production based on belting and transmission and to lower the maintenance of these commodities. This has been and is being accomplished to a great extent by the writer's belting and transmission standardization system which is in operation in all large plants of the DuPont Company and two of the largest of the General Motors Corporation.

This system is a practicable and a simple method for using the right belt in the right place as to type, width and thickness because it is based on a detail study of the following facts of each installation:

1. Conditions surrounding the drive, such as acid fumes, heat, steam, moisture, dust, grit, etc.
2. Horsepower to be transmitted.
3. Ratio of drive.
4. Diameter and speeds of pulleys involved.
5. Center distance between driver and driven.
6. Method of control.
7. Angle of drive.
8. Kind and method of loading.
9. Method of joining.

This system, owing to its simplicity, has shown substantial savings annually for the plants using it because each installation is based on scientific investigation and not left to guesswork. Therefore, based on the experience and knowledge derived from these large industrial operations it is my purpose to place before you executives in succeeding articles of this series, in a definite way, how it is possible for the right belting and transmission installation in the right place to increase the profits of your company.

Mechanical and Purchasing Divisions of large corporations are, in the main, well organized and have sections for their various mechanical installations and raw material requirements, supervised by men who are trained in their particular line, but why is it that belting and transmission materials—those important and absolutely necessary links between power and production—are considered a side issue and are left to the fate of being bought on discount and selected, installed and operated by men to whom a belt is just a belt and a bearing just a bearing. There is just as much justification for a corporation studying and understanding its belting and transmission conditions and requirements as there is for it to study and investigate its raw materials, because the savings on raw materials are at times very small, but 75 to 100% is possible on belting in a great many cases.



Fig. 2. Remove the control of your mechanical power transmission from the hands of men who consider horsepower calculations too difficult and place it in the hands of an experienced engineer.

An excessive annual expenditure for new belting and an excessive belt maintenance cost can be attributed directly to belting abuse caused by lack of knowledge of the subject and the failure of those in authority to realize that in purchasing belting they are not merely buying strips of material but are buying the transference of power from one point to another.

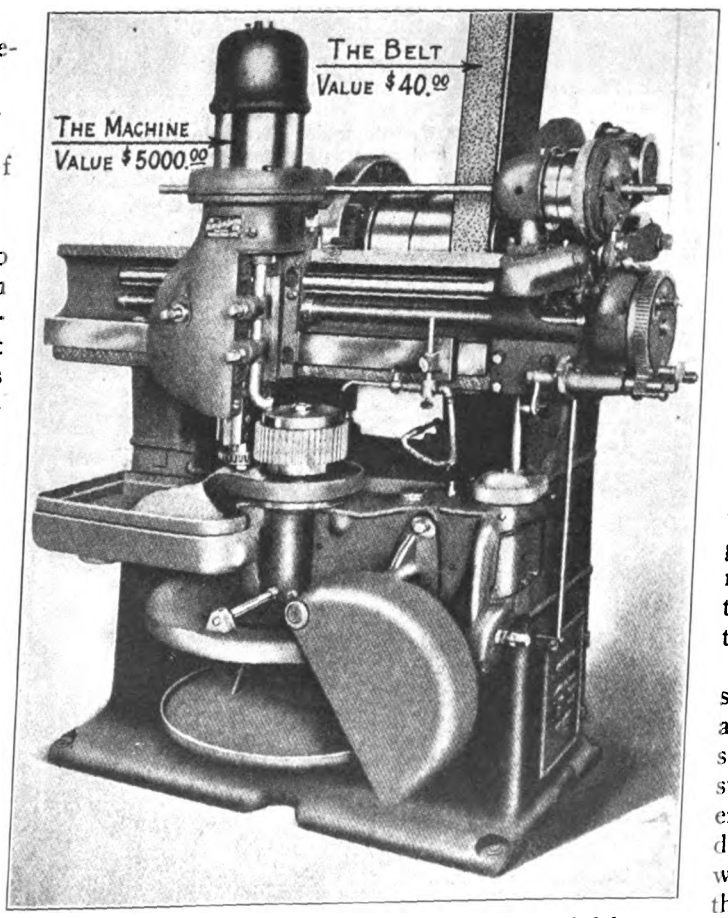


Fig. 3. This gear generator cost about five thousand dollars. Its output is dependent upon a forty-dollar belt. Belts are a governing factor in machine output.

The purchasing divisions of corporations should not prescribe the types, brands and sizes of belting to be used. This is the function of the mechanical section because Purchasing Agents have not the time to investigate the actual plant conditions under which the belting is called upon to operate; therefore price is the absorbing factor and the type or brand of belting purchased is a matter of discount. First cost is nothing when compared with the advantages to be gained by buying the correct type for the installation as the conditions and the peak load tell the story.

The mechanical division should determine the types and grades of belting best suited for their various installations, and an experienced engineer of this division should specify the widths and thicknesses of these types and grades for each individual drive, but in the majority of cases the

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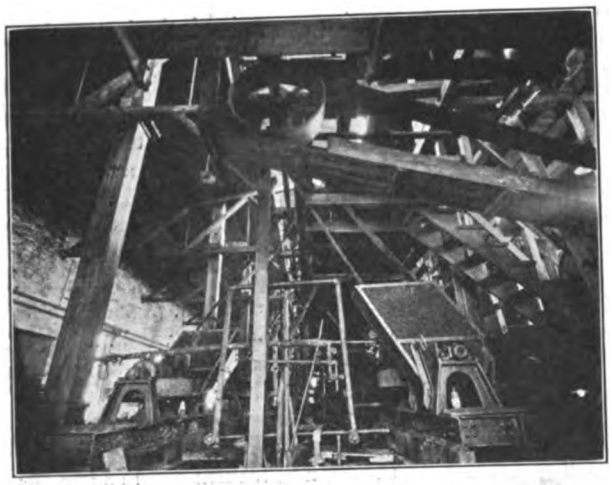


Fig. 4. Large sums of money can be saved or thrown away by the proper or improper selection of belts, particularly when the drive is a difficult one.



Fig. 5. The transmission appliances shown here are subjected to severe chemical condition. A wrongly chosen belt has a mighty short life in this environment.

selection of widths and thicknesses is left to millwrights and belt repair men whose function it is to erect machinery and repair belting. Most of these men are good in their particular trades but they have little knowledge of the engineering principles involved in the transmission of power by belting. Pulley width for belt width and guesswork for thickness are generally the determining facts in their minds. As an example the writer questioned a millwright who had considerable to say about belting in a large middle west automobile plant, as to the horsepower of certain drives and how he arrived at the size of the belting to deliver that power. "Horse power!" he replied, "that 33,000 and foot pound stuff is too much for me, I put one size on and if it slips and burns I try another until I get the right one." An experienced engineer can determine immediately the width and thickness of a belt for the power required. It should be obvious to an executive which man of the two is the better fitted to control an investment of thousands of dollars annually, because in the last analysis it is power, not belting, which is actually being bought and paid for.

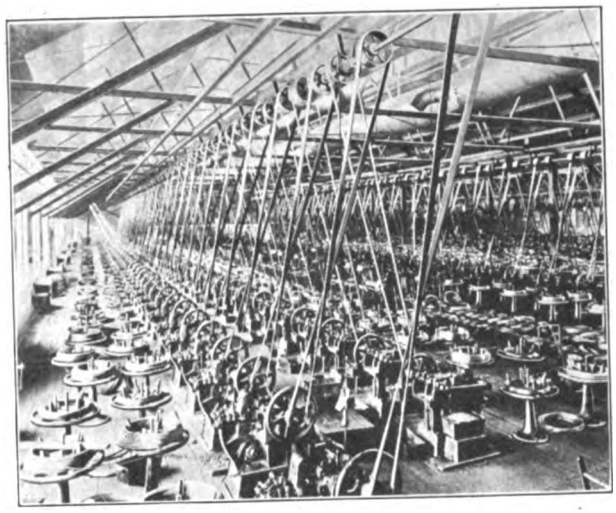


Fig. 6. Where belts operate under favorable conditions the principal factors to determine are proper width and thickness. But even so, the policy of "any old belt" will prove costly and quality must be demanded.

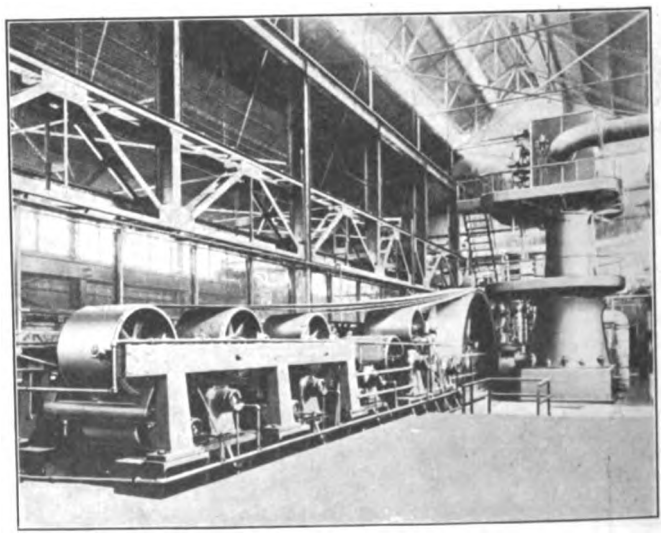


Fig. 7. Belts of such length and width as these run into big money. When improperly chosen, however, the first cost is only a beginning. Did you ever figure that your belts are on your payroll as well as on your purchase ledger?

Too many types of belting around a plant are as bad, if not worse, than using one as a cure-all for the combined transmission diseases of the institution, because by the constant use of one type, its characteristics after awhile become fairly well known, whereas a multiplicity of types creates waste and carelessness. There is or should be a particular reason for the use of each type of belting because each one has some particular attribute.

Good and well made leather belting is a steady and economical transmitter of power, but it all looks "good and well-made" in the roll. There is no type of transmission belting that offers the opportunity for misrepresentation as leather. The uninformed purchaser and consumer of this type is a splendid target for the leather pirate, because at 60 and 10 off the list good and well-made leather belting cannot be bought. Some concerns buy their leather belting on very elaborate and rigid specifications, and if all the leather purchased met these specifica-

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tions sometimes it would be perfect and sometimes it wouldn't, but what protection are specifications if there is no experienced man to check the belting against these specifications! The average man in the plant knows "piping" of a leather belt when he sees it, but that signifies nothing because first quality back-bone centre stock leather may "pipe."

Leather has held its place in the belting world for years as the best transmitter of power known and no doubt this is true when intelligently selected and properly applied, but there are other types of belting which are splendid power transmitters and possess qualities of resistance to gases, heat and moisture that are in many instances lacking in leather, therefore it will pay to investigate their characteristics and attributes.

It is obvious from the foregoing that belting deserves attention and respect if it is to serve you profitably, but regardless of the attention given belting, the transmission installation around which it operates must not be neglected, as there is nothing more disastrous to the economical transmission of power than poorly designed and neglected shafting and pulley layouts.

The economical arrangement of shafting, bearings, pulleys and clutches is absolutely necessary for the production efficiency of any plant, because they are closely allied with belting as the one without the other is worthless. Power wasting transmission installations are prevalent in many cases due to the gradual growth of a plant. Addition after addition is added and the power taken from existing sources, until finally you create a complicated mass of power transmitting apparatus which requires real money to rotate it and real money to maintain it.

The business of transmitting your power mechanically is just as important to you as the business of any other part of the organization. Control it by systematic methods supervised by engineers who understand the principles of the mechanical transmission of power and who are familiar with the various types of belting and transmission machinery on the market. Each drive or battery of drives should be studied and the results standardized and scheduled for practical use. Each transmission arrangement should be tested for power and the possibility of eliminating superfluous shafting, bearings, and pulleys considered.

Notwithstanding the fact that all manufacturers and industrial corporations aim to give service and place on the market products of merit and quality, their fundamental business is to pay dividends.

These dividends are generally estimated and based on sales, but do profits entirely depend on sales? Selling prices are very often fixed by competition, therefore, savings which are profits, must be found to some extent in the purchasing and manufacturing ends by buying with knowledge the commodities needed and installing and operating them intelligently.

Your transmission of power by belting is a hit or miss proposition capable of consuming money rapidly if you have no system of belt selection and installation control. Many plants keep card records of belting performance, but if they are not comparative records of one type over another for the same operating conditions and the results standardized for use, they are worthless. Remove the control of your mechanical power transmission from the hands of men who consider horsepower too much for them and control it by a definite system. Engineers control your coal, your steam and your electric power transmission, then why leave the actual connecting link between these power generators and production to chance?

The wasteful installation is not necessarily the complicated one. Frequently the simplest apparatus to drive will cost the most, because no thought has been given as to the most economical driving method possible.

As an example of this, Fig. 8 shows a money wasting, nerve racking and dangerous arrangement that had been running as shown for years. This small unit required $850.00 annually to maintain it owing to the mis-use of direct connection and the impossible arrangement of the drive. Fig. 9 shows the method employed to eliminate this waste and the figures given prove that attention to transmission arrangement pays.

EDITOR'S NOTE: This is the first of six articles by Mr. Staniar, on the subject of mechanical power transmission. The second article will appear in October.

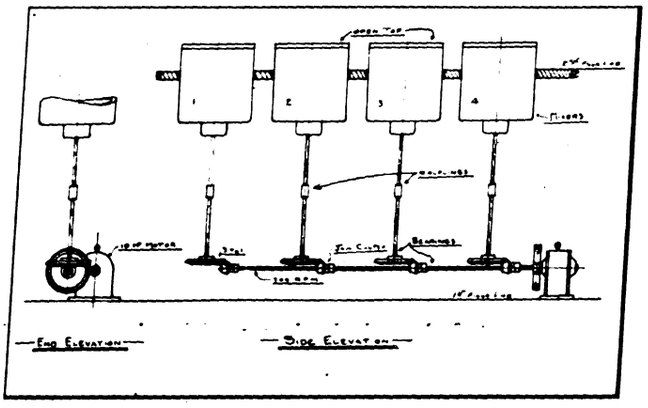


Fig. 8. This money-wasting, nerve-wracking arrangement had been running as shown for years. It required $850 annually to maintain it, owing to the impractical arrangement of the drive. This drive was revised as shown below.

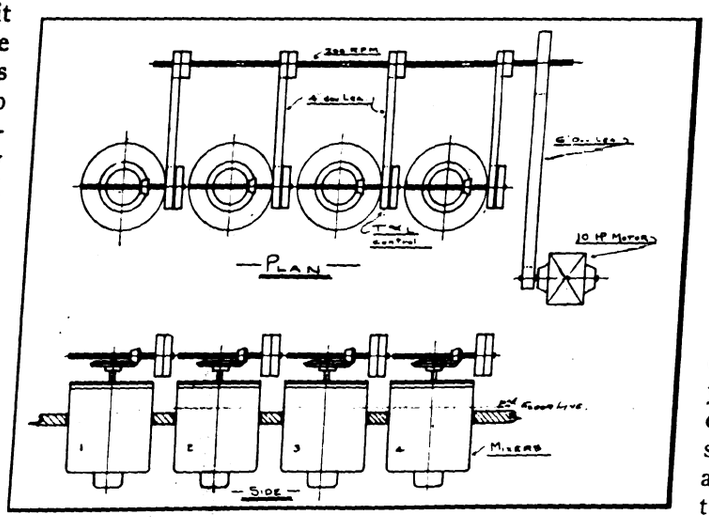


Fig. 9. The total cost of making these changes, including all material and labor, came to $1100. The new arrangement saved $174.72 per year in power and $850 in maintenance charges, or a total of $1024.72. A first-class investment.

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Fig. 1. Vise and bench should be fast friends. Make the vise fast to the bench by using bolts instead of lag screws. This is the first step in giving it a square deal.



Fig. 2. A good vise is a careful and accurately made tool. Run out the screw and oil it thoroughly not only when it is first installed but at regular intervals afterward.

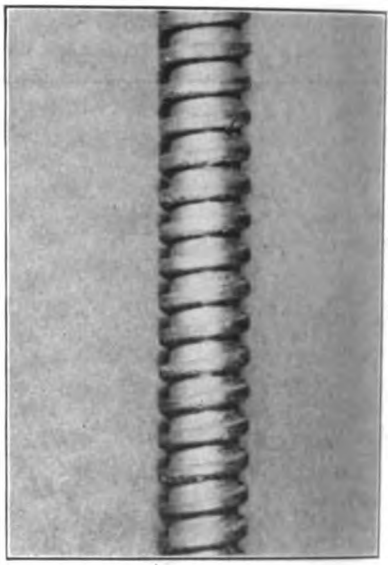


Fig. 3. Neglect of lubrication causes unnecessary depreciation. Here is what happens to a vise screw that is not oiled. This might be entitled "How dry I am!"

Giving the Vise a Square Deal

What to Do, and What Not to Do With It

By John H. Van Deventer

HERE'S to industry's bull dog—the vise—the most used and the most abused tool in the shop. Why not give it a square deal?

A good vise costs money and a poor one costs more. Like every other tool in your plant, however, it is not the first cost that counts, but the amount of service that is given before replacement is necessary. You can easily double the life of your vise equipment by treating it properly.

Vises are built to stand lots of hard work. But no tool, even one as ruggedly and strongly built as a good modern vise, will have as long or as useful a life when abused as when properly treated.

Profits today come from the little economies rather



Fig. 4. One good way to ruin a vise. If longer handles were needed they would be made so. Throw away the pipe extension and save a good vise from the scrap heap.



Fig. 5. Screw and lever make a powerful combination. Anything that should be held in a vise can be clamped securely by using the handle properly as shown above.



Fig. 6. Striking the vise handle with a hammer is bad business. It shortens the life of this useful tool and thus increases shop "overhead."

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Fig. 7. Another good way to tighten the vise is by using this double leverage. Keep the work as nearly in the middle of the jaws as possible.



Fig. 8. Don't hammer or cut metal on the vise slide. Anvils and pounding blocks are cheaper than vises.



Fig. 9. If you must cut metal in a vise do it this way. Then you won't chip or mark the finished surface of the slide.

than from the big ones. While it is true that a single vise does not cost a great sum of money, just multiply its cost by the number that you have in your plant and see what a respectable investment is represented.

Always think of the vise as a carefully made machine tool. Its parts are machined to close measurements. It is intended to be an accurate tool when you put it to work, and how long it will remain in that condition depends largely upon the user. Most vise mortalities are caused by lack of lubrication. It is a good plan to have a regular day each month for oiling your vise screws, just as you do for replenishing oil in line shaft hanger bearings. Then you will have smooth, easy working vises which not only will last much longer and reduce the overhead, but will save the operator's time. Regular jaw inspection is also a money saving feature which can be adopted to advantage. The duty of a vise is to hold work and where jaws wear smooth the vise cannot perform this function effectively.

Study these pictures which were especially posed for us in the plant of the Charles Parker Company, of Meriden, Conn. It will well repay the time spent. In them are shown some of the more common and damaging mistakes that are made in using or rather abusing this useful tool.

Perhaps you would like to post these pages in your assembling departments so that those who use these vises may think about giving them a square deal. If so, we will be glad to see that you get extra copies of this article for that purpose.



Fig. 10. One of the very bad things you can do to a vise is to use it for bending pipe or bars. If you don't know a better and cheaper way to bend than this, write and ask us to tell you how.



Fig. 11. It nearly hit him on the toe. The vise jaws were worn smooth and hence the work slipped out of them. This might have meant a week in the hospital.

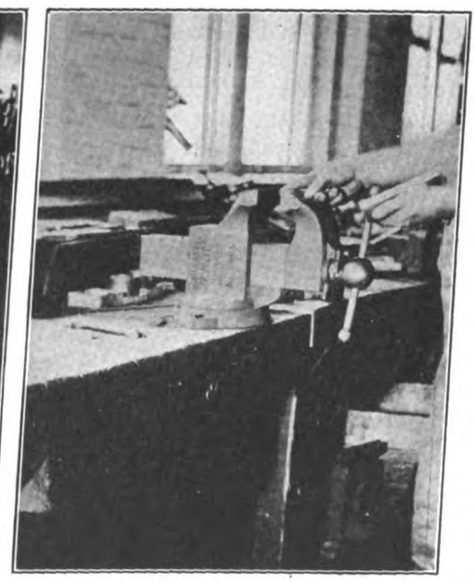


Fig. 12. Good vises have renewable jaws. Regular inspection and replacement save time and prevent accidents.

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A New Use for Old Rails

By Edwin F. Payne

WHAT becomes of the old steel rails?

A quarter of a century ago a steel maker would have told inquirers that these rails were remelted, sometimes in combination with other steel, and again became what they were originally, ingots, and that to produce whatever materials were desired, the whole process of steel making was repeated.

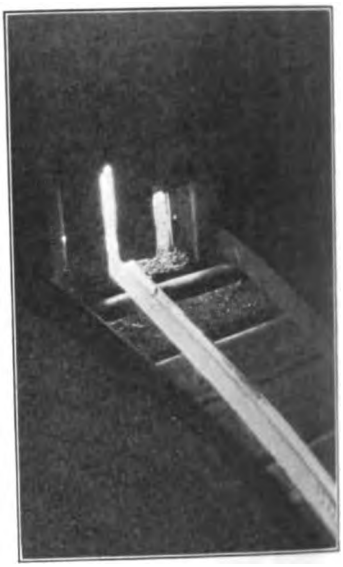
But about twenty-five years ago certain keen steel manufacturers devised a process whereby these rails could be fabricated to new uses by a more economical process. They realized that as railroads adopted heavier engines and cars, there would be more and more a replacement of rails with heavier sections and that a growing tonnage of this material would be available.

Then began an investigation of the condition and the physical properties of the rails removed from service. Metallurgists were set to work and elaborate tests were conducted in physical laboratories. The results were so encouraging that these pioneers determined to reclaim this material by rolling it into smaller sections.

The first market was in hard steel angles and other light sections going into the manufacture of agricultural implements, in frames for iron beds and in tubing, and companies were formed and mills designed for producing these sections from rails. So satisfactory was the product found to be that even today practically all light farm implement sections are rolled by these mills.

It was not long, however, before mill owners found that they needed a wider field; that new uses must be found for the rails which railroads were eager to turn over to them because of the better price obtained.

Steel had been in use to some extent as a building material for years before the advent of reinforced concrete. Engineers had become familiar with it in the form of "I" beams, channels and shapes of that nature. This material was made from low carbon steel and from its use it had come to be termed "structural steel." It had a minimum elastic limit of 33,000 pounds per square inch and a minimum tensile strength of 55,000 pounds per square inch. It was very ductile.



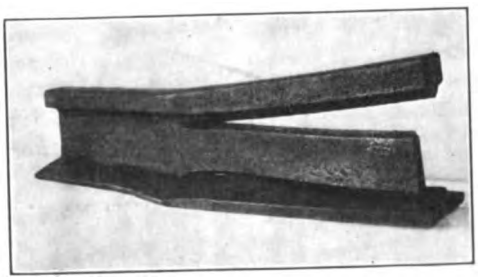
The rail emerges at a temperature of 2,000 degrees and proceeds, white hot, to the slitter.

This last was a very necessary requirement for the reason that the material was roughly handled in punching and riveting during fabrication. Through practice, therefore, engineers and builders had come to regard structural steel, or at least steel of the same physical properties, as the ideal material for building purposes.

But the natural tendency was continually toward a material of as great strength as possible, in as much as the prime object of the steel in the concrete was to take up the tensile stresses which the concrete itself was not capable of resisting.

The art of building concrete structures advanced by leaps and bounds and with this came additional knowledge as to the stresses developed in various types of reinforced concrete work. This knowledge continued to justify the tendency toward a material of greater strength consistent with a sufficient amount of ductility.

That was the preparation which brought into use hard grade re-



This shows how the slitter rolls cut into the rail like a knife cuts into cheese.

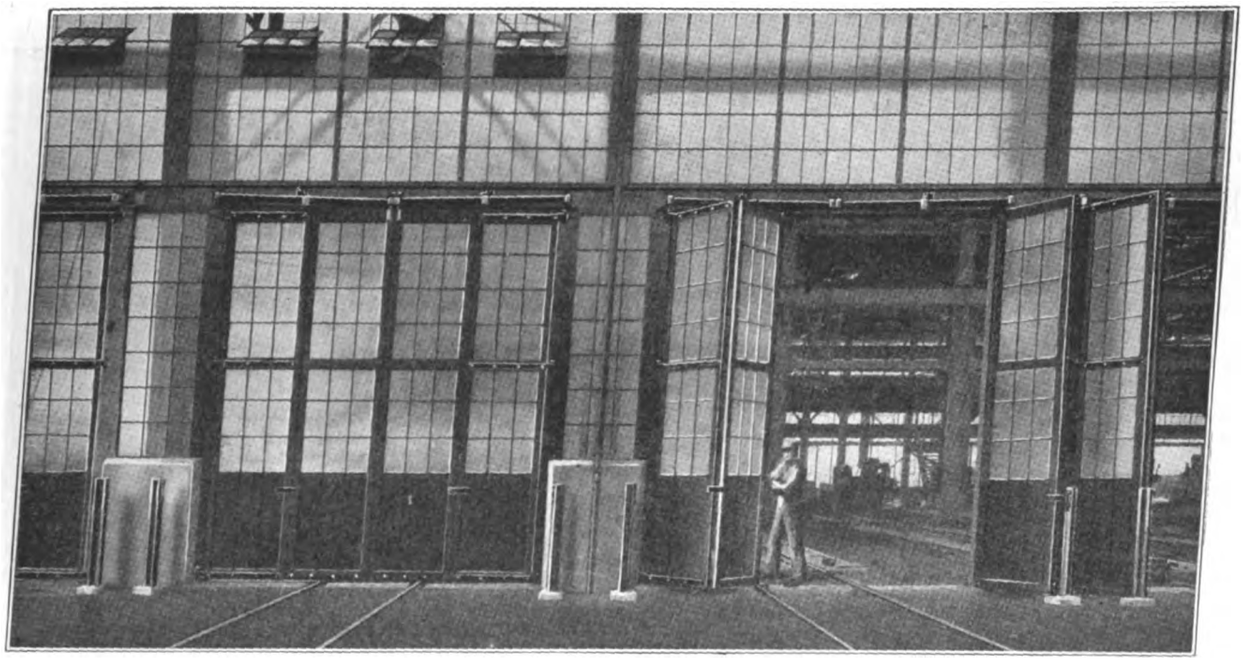


When the rail emerges from the slitter, it is in three sections as shown above.



Then the split sections are rolled to shape. Brawny arms and quick eyes are needed for this operation.

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inforcing steel, the new material having a minimum elastic limit of 50,000 pounds per square inch and a minimum tensile strength of 80,000 pounds per square inch.

It was early found that the most practicable way to use the rail was to slit it into three sections—head, web and flange—and to roll these parts separately.

Then comes the heating and it may be remarked that temperature is a whole technical subject in itself. The practice generally is that the rails shall remain in the furnace about forty-five minutes under a temperature of approximately 2,000 degrees.

How is this material regarded by scientists?

When rail steel reinforcing bars began to make their appearance on the market, the American Society for



The finished bars are cooled on these gratings. Curiously enough they are called "hot beds."

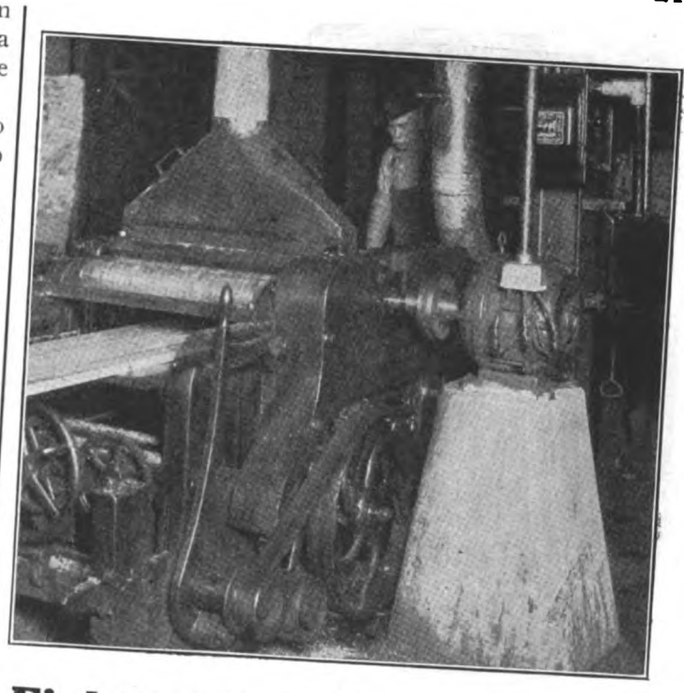
Testing Materials, then, as now, the highest authority in the United States, instructed Prof. W. K. Hatt of the engineering department of Purdue University to conduct an investigation of these bars.

Ductility and tensile strength were determined by numberless experiments. Prof. Hatt's conclusion was that rail steel bars met the requirements of hard steel bars. The result was that the specification finally drawn to cover this material was precisely the same as that for hard grade billet bars, namely: 80,000 pounds per square inch minimum tensile strength and 50,000 pounds per square inch minimum elastic limit.

This specification now is known as A 16-14 of the American Society for Testing Materials and is the established standard for rail steel reinforcing bars.

From a very small beginning, back about 1900, the use of rail steel has grown until now there are more than a score of mills engaged in using this material. Not only is it fabricated into reinforcing bars but it is made into fence posts, frames for iron beds, tubing, agricultural implements and various other articles that take their place in the everyday life of American citizens.

More than 1,000,000 tons of rails are used each year by mills in which there is an investment of between $30,000,000 and $40,000,000.



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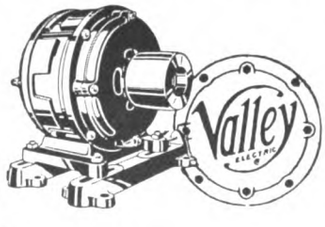
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The Human Element

Safety as an

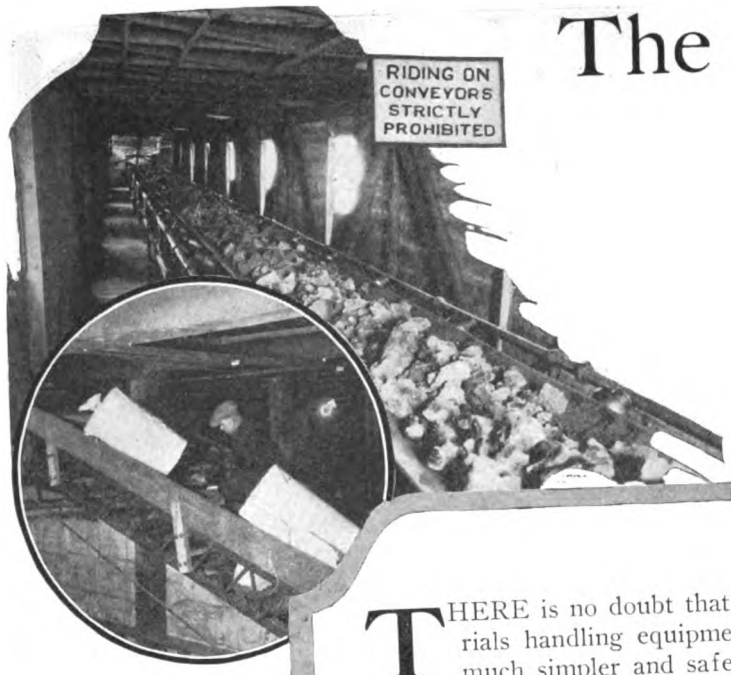


Fig. 1. Riding on conveyors is more dangerous than it looks. Plenty of signs located in light places will make the joy-rider think.



Fig. 2. Conveyors of this ty carrying miscellaneous su parts, should be protected w a wire safety net to ca those which might fall.

THERE is no doubt that the application of materials handling equipment has made handling a much simpler and safer operation. Because of the many mechanical devices which come under this heading, it is necessary to provide safety rules and regulations so as to keep the operators from injuring themselves and others. Safety precautions should not only apply to mechanical equipment, but also to such simple devices as wheelbarrows, hand trucks, gravity chutes, unloading skids and other devices which are now used in connection with many handling operations.

For a number of years this magazine has described editorially all types of materials handling equipment, but this is the first time it has touched upon the importance of safety in connection with this class of equipment. The National Safety Council, Chicago, in all its sections has paid particular attention to the possible hazards developed by careless operation of handling devices. In addition, they have found that such equipment usually has the effect of eliminating many other hazards, thereby becoming a factor in the reduction and prevention of accidents.

No industry or type of equipment can be safely oper-



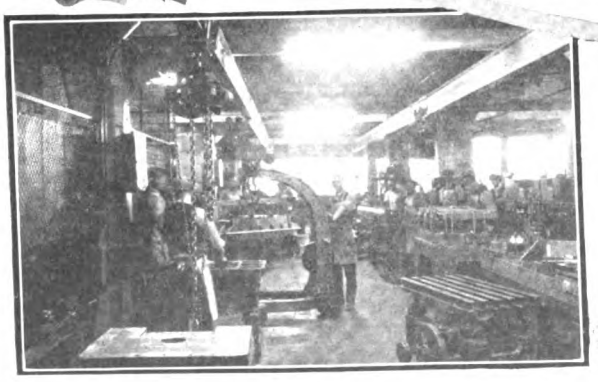


Fig. 3. Skilled men should be kept on the payroll in service and not in the hospital. Lifting devices in tool rooms save many bad accidents and strains. The insert shows how one company has even made the portable crane more safe by attaching auxiliary safety legs.







Fig. 4. Bolting a chain is a shift and hazardous. Every not only think of himself, fellow workers. A new chai than an accident.

Fig. 5. It does not seem possible that an a happen when using a wheelbarrow for material. Accidents do, however, h wheelbarrows are used, and the best safe with this equipment is to properly balan

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in Materials Handling

Operating Factor



Fig. 6. The old two-wheel stevedore hand truck, modified to fit the container or package being handled, often proves a valuable handling device. Such adaptation of an old principle is also an important safety factor as it eliminates stresses and strains on the trucker.

Fig. 7. Where a number of hand trucks are used, it is necessary for the trucker to be alert and cautious, especially when coming around corners or from behind other materials.



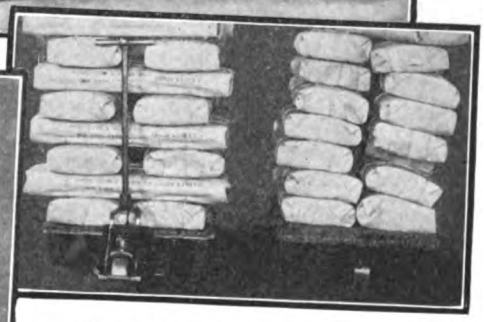


Fig. 8. It is always essential when transporting materials, to have the load properly piled on the truck. Which of these two loads do you think is an accident maker?



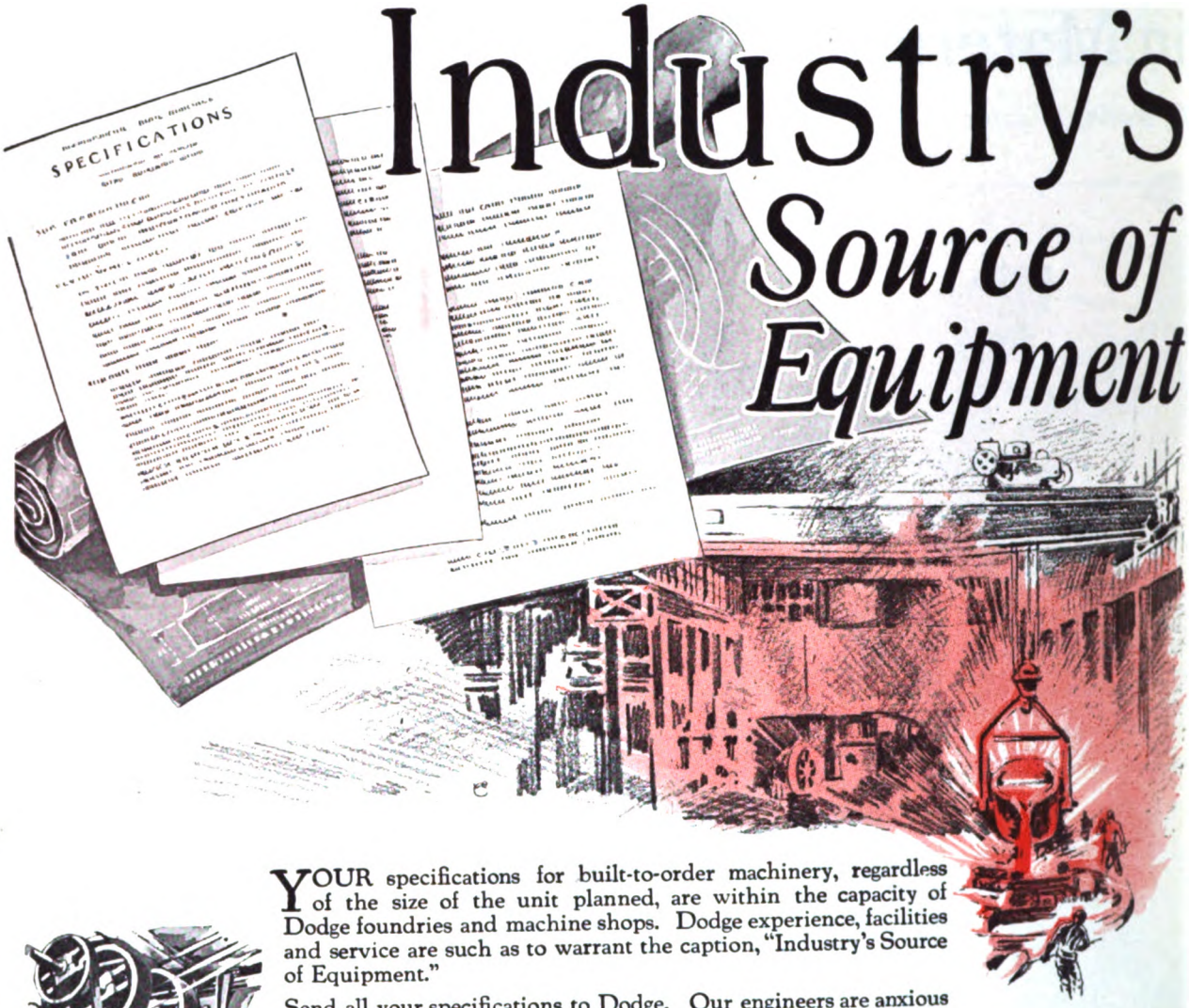


Fig. 10. If the juice goes off it's "Lights Out" for them. Whenever an electric magnet is used for lifting any kind of material, the men should be instructed to keep out from under.

Fig. 9. In order to reduce costs, it is sometimes advantageous to have the driver pick up the load. A mechanical helper often makes the work easier, quicker and, at the same time, safer.

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Industry's Source of Equipment

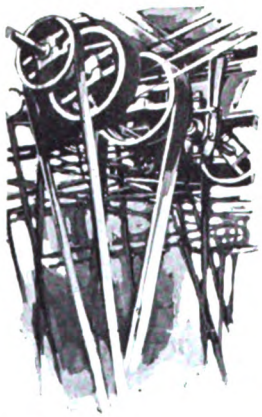


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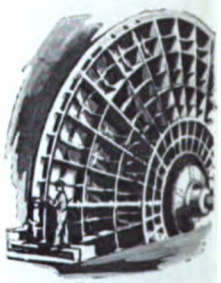
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ated unless certain rules and regulations are complied with. If men would only think, many accidents could be prevented. It is the human mind, more than the mechanical equipment, that is the cause of accidents. It is true, however, that the mechanical equipment needs attention during operation and constant supervision from a point of maintenance if accidents are to be entirely eliminated.

The manufacturers of this equipment generally provide their devices with every conceivable type of safety feature, and yet after installation the equipment becomes an accident maker due to the fact that workmen will not operate it correctly, or they take chances in stealing rides while the equipment is in motion.

It is important that skilled men should be kept on the payroll in service and not in the hospital. If the operator of a drill press, planer or lathe is absent the production output of that machine is seriously reduced. The same is true if tool makers are off work. Their absence frequently ties up production on many machines. It will, therefore, be seen that any device which assists these men in their work should be given serious consideration. Fig. 3 shows a tool room of a large manufacturer and some of the devices used in this tool room simply for handling and lifting. It will be noted that I-Beam trolleys and chain hoists run parallel with the room for lifting and transporting the heavy dies. In addition, a portable jib crane and a special elevating die truck is used. Many other devices, such as elevating electric trucks, crane trucks, etc., can also be used to advantage in such departments.

It is frequently found after operating a piece of equipment in the industrial plant that difficulties arise either due to the operator or to the conditions under which the equipment has to operate, which makes that piece of equipment unsafe. Such is the case in one plant where portable jib cranes were used about the shop. Here it was found that one of the hazards experienced with portable cranes was the danger of tipping. In order to overcome this condition, the safety engineer attached permanent stationary auxiliary feet to the sides of the crane frame in order to prevent tipping. Thus many small items can be taken care of locally after the equipment is put in operation.

One of the main dangers in slinging loads is the shiftlessness of certain individuals and their lack of knowledge as to stresses and strains. For instance, Fig. 4 shows a condition encountered altogether too frequently. Men should be instructed that a bolted chain is dangerous. In this case, the bolt broke and the heavy axle fell on the truck chisel, causing the truck handle to fly up and strike the truckman a severe blow on the jaw which might very easily have resulted in a fatality.



Fig. 11. Untidy plant yards, dangerous corners for trucks, industrial railways, and tractor trailer trains, frequently lead to accidents and delays in the shop transportation system.

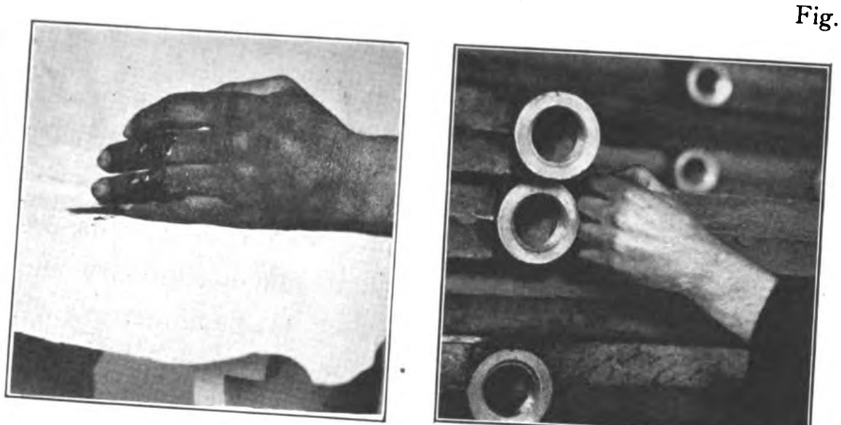


Fig. 12. Your mind controls your acts. Think straight and prevent accidents. This is true even when piling radiators.

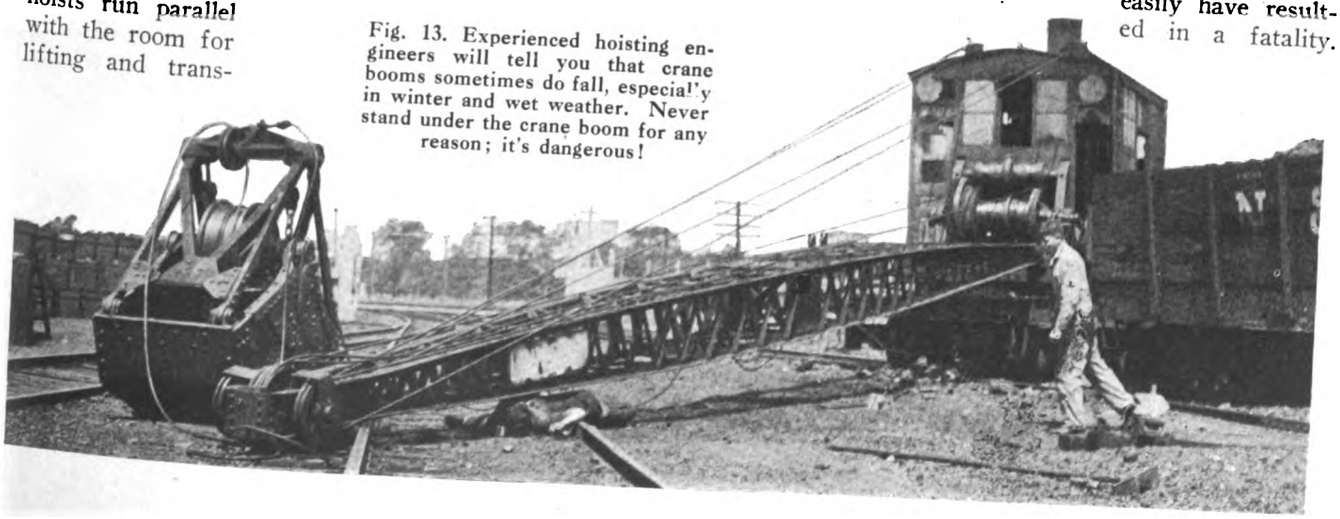


Fig. 13. Experienced hoisting engineers will tell you that crane booms sometimes do fall, especially in winter and wet weather. Never stand under the crane boom for any reason; it's dangerous!

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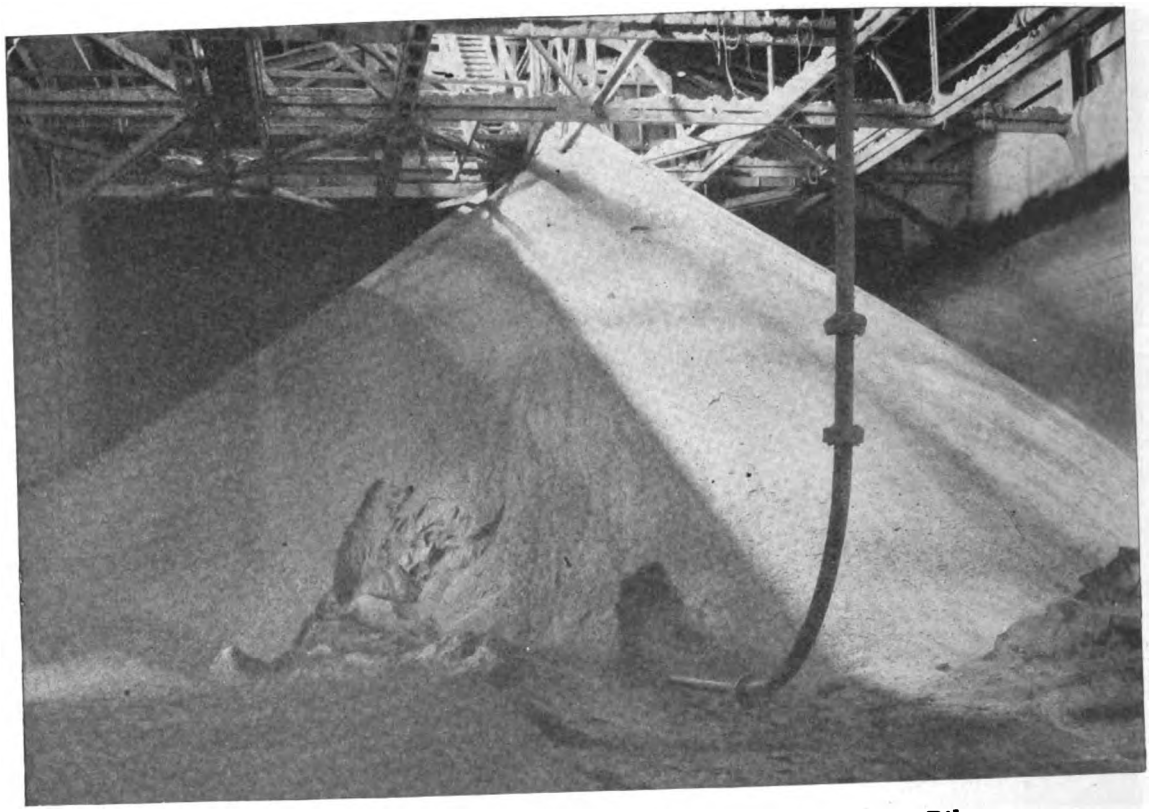


Fig. 1. Conveying Pipe Shown Pulling from Storage Pile.

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New Weymouth Station Is Almost an Automatic Power Plant

By B. C. Mallory

IN a large, modern power plant, there are literally hundreds of automatic controls and labor saving devices. The Weymouth Power Station of The Edison Electric Illuminating Company of Boston was designed and built by Stone & Webster, Inc., under the direction of I. E. Moultrop of the Edison Company and is an example where coal, air, water, steam, ashes, soot, and cinders are taken care of with a minimum of labor.

At Weymouth coal is taken directly from ocean-going steamers and delivered right to the boilers by a continuous system of electrically operated coal handling equipment.

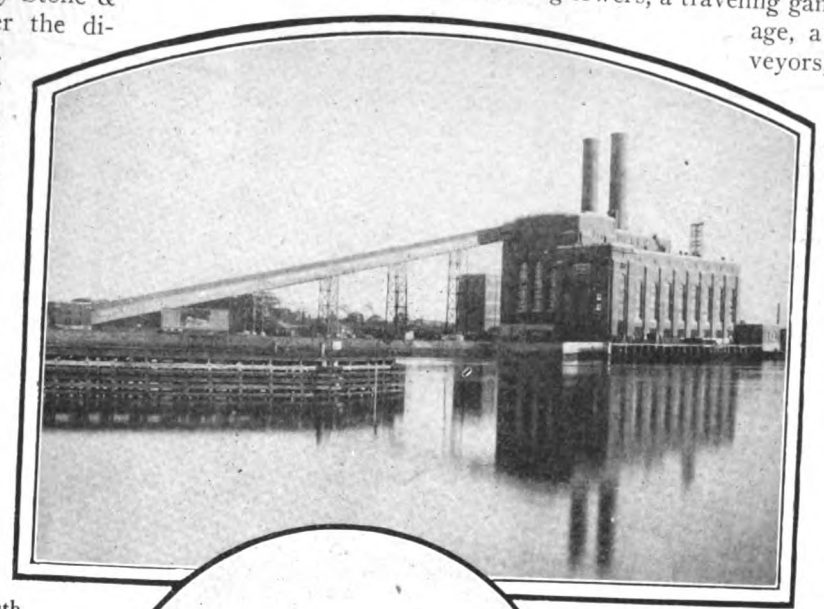


Fig. 1. The new Weymouth Power Station is a splendid example of the cost cutting ability of modern power machinery.

The accompanying illustrations show how coal is picked out of the ships and sent to the boilers or to the coal storage pile. This system includes two traveling coal unloading towers, a traveling gantry bridge for coal storage, a coal breaker, belt conveyors, with coal sampling and weighing apparatus.

The traveling gantry bridge takes coal from a belt conveyor to any place in the coal storage pile. The grab bucket on the gantry bridge picks up the coal from the storage pile and returns it to the system delivering coal to the boilers.

Automatic regulators control the boilers so that they supply efficiently the right amount of steam to the station. The pressure and

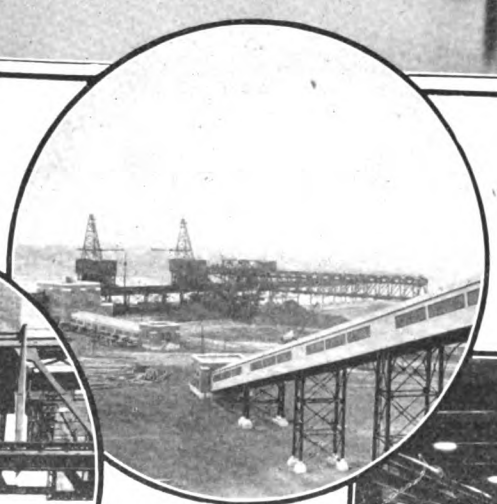


Fig. 2. An inclined conveyor delivers coal to the bunkers located at the top of the blower house.

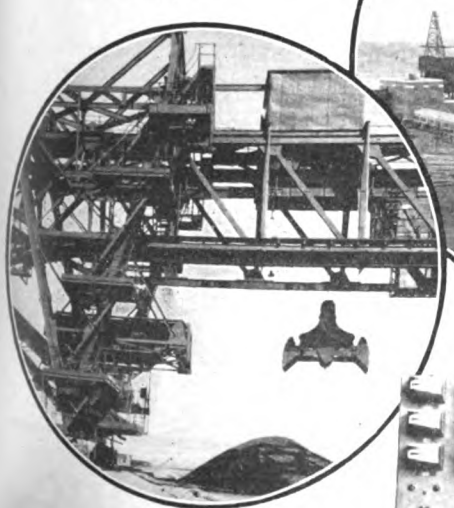


Fig. 3. A traveling Gantry crane equipped with grab bucket takes coal to or from storage.

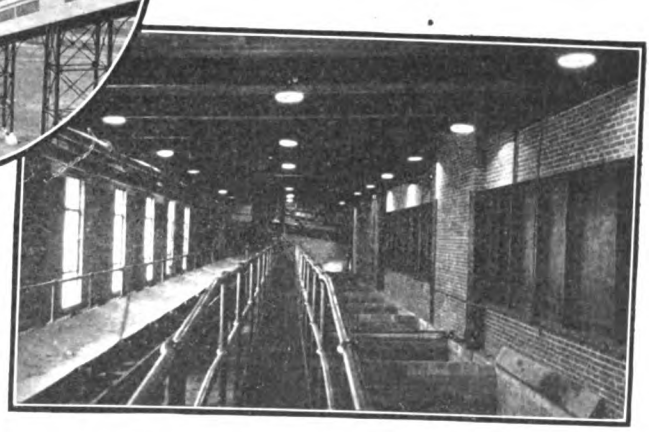


Fig. 4. Belt conveyors carry tons of coal without human labor or apparent effort.

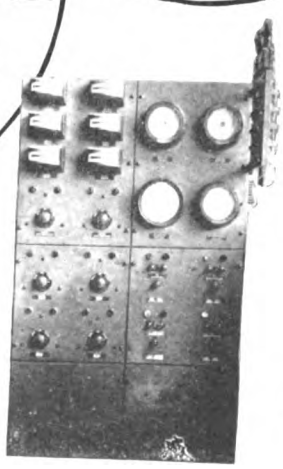
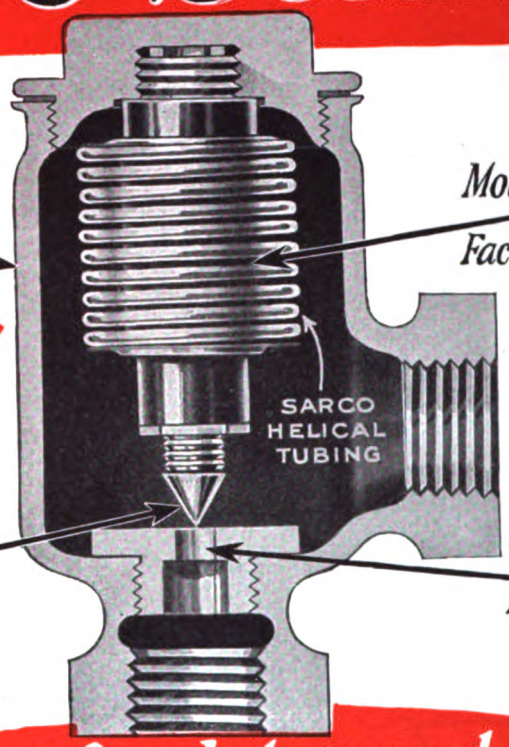


Fig. 5. The water levels in tanks and the flow of condensate in the turbine room are all controlled from the electric control panel.

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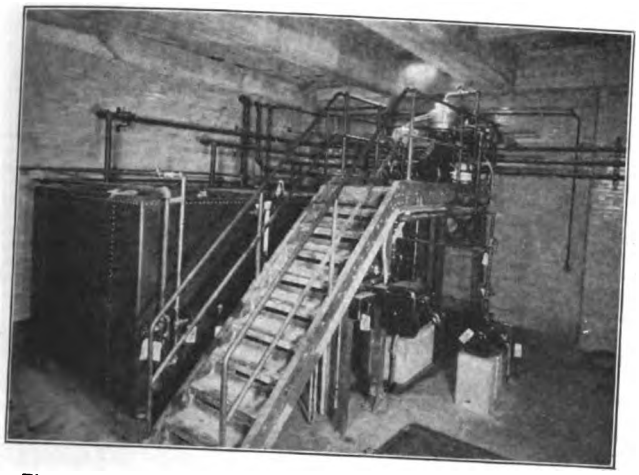


Fig. 6. The oil storage room has facilities for storing and filtering all turbine oil.

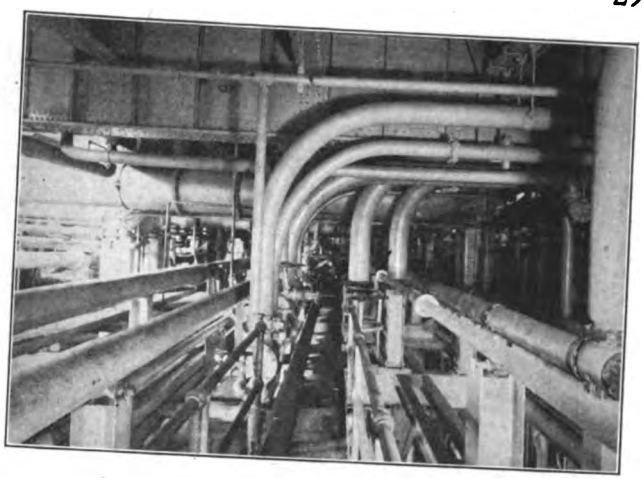


Fig. 8. Pipes for various services are placed together in a pipe gallery for ease of operation.



Fig. 7. Thirty-six inch atmospheric relief valves are hydraulically operated.

amount of steam required by the station is maintained by a master boiler controller which is mechanically operated by the pressure in the main steam header. This master gage acts in a similar manner to the governor on an engine. Individual boiler controls regulate the forced and induced draft fans and the stoker speed to give the proper amounts of coal and air to the fire. The pressure in the boiler feed headers controls the boiler feed pumps so that they supply the proper amount of water at the right pressure to the boilers. Each boiler has two float operated regulators that govern its own feed water supply from the headers.

The ashes, cinders, and soot from the boilers and smoke flues drop by gravity, into separate hoppers which empty into regular motor trucks. Gates and valves, operated by compressed air empty the various hoppers into trucks that take the ashes, soot and cinders away from the station.

In the turbine room, even though there are many pumps, heaters and various other equipment, the majority of it is controlled automatically. The governors on the turbines supply the turbines with the proper amount of steam to generate whatever load is put upon them. Large valves throughout the station are opened and closed by a push button electric switch requiring no more labor than turning on or off the light in a room.

After the air compressor is started, it runs automatically, keeping a definite pressure and supply of compressed air in the supply tank.

The water supply tank is automatically filled from the city water mains by means of floats that operate the control valve electrically. The surge and service tanks are kept filled automatically by pumps that start, run or stop in accordance with their water levels. Floats that throw in switches control these pumps.

A flow control panel on the pump room floor has water level indicators, in the form of various colored lights, and recording gauges that show the operator the actual water levels, and a record of what they have been. This panel also has the push button controls for all condensate valves in the system.

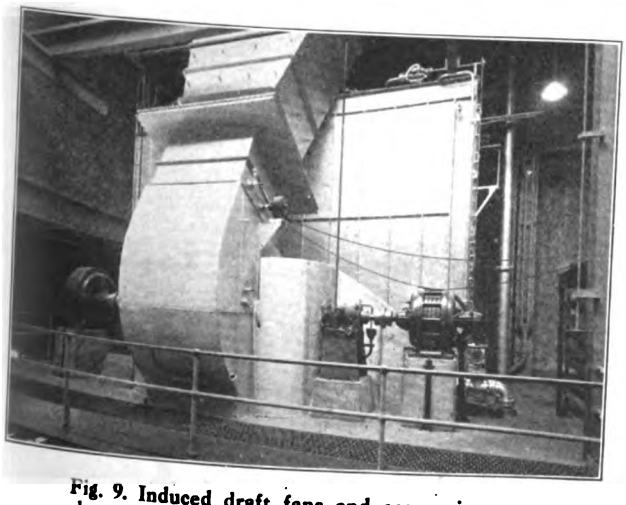


Fig. 9. Induced draft fans and economizers, shown above, aid in attaining high combustion efficiencies.

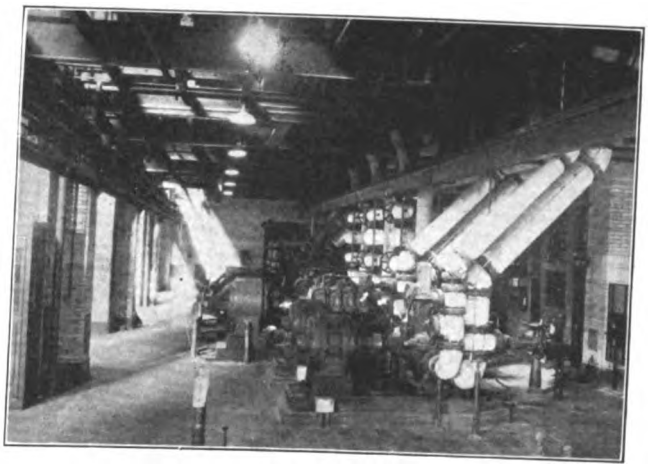
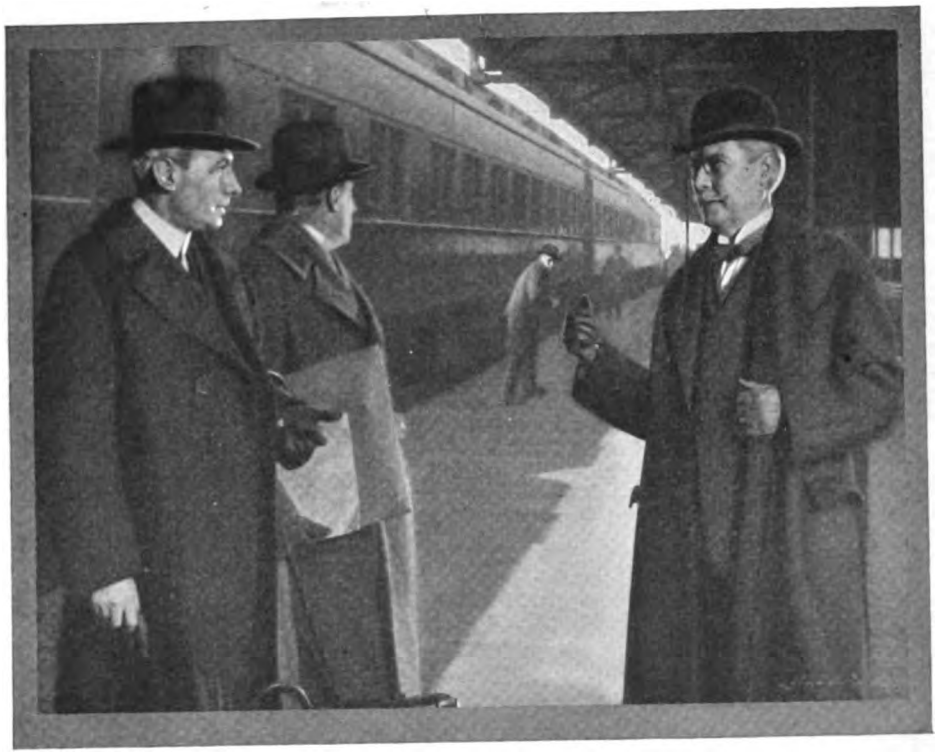


Fig. 10. The pumps may be automatically controlled or hand controlled from one aisle.

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GRINNELL Piping Systems are famous the country over for their fine appearance, low cost maintenance and operating economy. When it is possible to buy the very same proved materials used in such equipments, it seems foolhardy to think of buying the kind of speculative stuff the price-paring tactics of F. O. B. Jurdine and his ilk are bound to produce.



GRINNELL
PIPE FITTINGS

George Jurdine (F. O. B.) tells his secret

"GOING through to Chicago tonight, Mr. Jurdine?" asked the steward, addressing a man who was finishing a sumptuous dinner at the same table with Volker and Treadwell.

"Only to Columbus, this time," came the reply. "I expect to locate there."

Treadwell shot a glance at his companion. Both knew that this must be George Jurdine, the man proposed by their General Manager for the presidency of the company. They were to have met him for the first time in the morning at the Columbus factory.

Introductions over, Treadwell, Chairman of the Board of Directors, said "Mr. Volker, our treasurer, is worrying about the excessive cost of the reconstruction and modernization work at the Columbus Plant.

"He finds that actual quotations on materials, as turned in by our Consulting Engineer, do not square with the estimate worked out by our president six months before he died. That old estimate was taken as the basis for our financial program."

"I can understand that," said Mr. Juddine. "Your president and I were trained in the same school of hard buying. As purchasing agents in the old days we learned our lesson. No consulting engineer has the instinct for getting rock bottom prices. He can't visualize materials in the maker's shipping room waiting for a buyer, nor can he read the lesson of the empty car standing alongside the shipping platform. I make F. O. B. stand for 'Ferret Out Bargains.' And, likewise, on all installation work I go after rock bottom prices and get them."

"But," exclaimed the treasurer, "we propose to install all these materials ourselves."

"That makes no difference," said Mr. Jurdine, emphatically, "Let me tell you an old secret of mine. Where you get quotations on any materials used in power, heating and process piping, go out and shop the way a thrifty housewife does. List your requirements by items. Let 'em all see they must sharpen their pencils. Then reply to each one that he is high. And when they are through cutting tell them they need to shave prices. Take your time, sit back, and wear them out."

Treadwell: "That kind of buying ought to help balance our budget, Volker."

Volker: "Why can't we get a stateroom and go over these figures? With a few facts to lay before the Consulting Engineer tonight we can hold up the orders he insists on placing at once."

Mr. Jurdine shifted uneasily, gathered his change from the waiter and suavely said: "I would be very glad to, gentlemen, but I have a quarterly report to finish before we reach Columbus. Really, Mr. Treadwell, if you intend to honor me with the presidency I would suggest you postpone the meeting with your Consulting Engineer so I can handle the whole matter in my official capacity."

* * * * *

"WASN'T that George Jurdine I saw getting off the car ahead?" asked the Consulting Engineer, as he greeted Treadwell and Volker on the station platform.

Volker: "Yes, it was, and he's surely a live wire. I'm for him 100% for president."

"What! George Jurdine. Why, his high production costs were always the joke of the engineering world. Back East where his disgraceful plant equipment sunk the Empire Chemical Company, he was known as old F. O. B. Jurdine."

Treadwell: "What's that about F. O. B.?"

Consulting Engineer: "His mind starts and stops with the price on a car. 'Foolish Old Bunk,' we called it. He can't understand that everything in a plant should be bought 'R. W. U.' as somebody once said of him."

Treadwell: "I never heard of 'R. W. U.'"

Consulting Engineer: "Right When Used! As regards piping, that means materials which permit quick installation at low cost, and a finished system economical to run and easy to maintain. For such a system you need to buy every item 'R. W. U.'—bends, fittings, hangers, welded nozzles, all 'Right When Used'."

Treadwell: "I see it. That was the failing of our old President. We are paying for his 'hard buying' in the expensive modernizing of this comparatively new plant."

Volker: "I *don't* see it. As our Consulting Engineer you're responsible for final performance and when our own men do the work you will be able to spot and reject imperfect materials."

Consulting Engineer: "That's thoroughly impractical; virtually impossible, unless you want to cramp production for a year. No. 'Right When Used' is the only safe yardstick; and always means to me the Grinnell Company. As you know, they have installed more finished piping equipments than any other firm in the world. Since they sell in the open market the very same fabricated material, fittings and hangers that they use in their own work, you can be sure that those materials are right when used."

* * * * *

For further information address Grinnell Company, Inc., 307 W. Exchange St. Providence, R. I.

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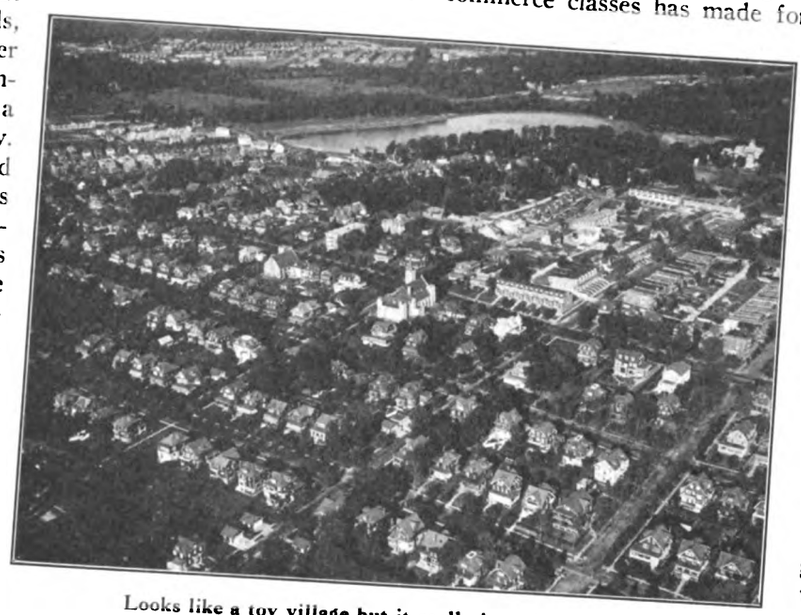
Industry No Longer Plays a Lone Hand

Aid of the Community Is Necessary to Solve Industrial Problems

By John A. Piquet

ONCE more industry is on the march! From out the inner office the manufacturer goes to seek and accept the coöperation of the community, to better the living conditions of his workmen or to improve the transportation and other outside facilities he is dependent upon. And from towns and cities that no longer represent a scientific location for his plant, or that will not give him that coöperation he needs, many a manufacturer is moving to communities that give a thought for industry.

The Shredded Wheat Company is but one of many modern manufacturers that has adopted the community as a partner, and trusting it in full, it has received in full. Not only its great daylight plant at Niagara Falls in the Buffalo area of strategic location and white power, but the selection of cities for its Pacific Coast and European plants, is of interest.



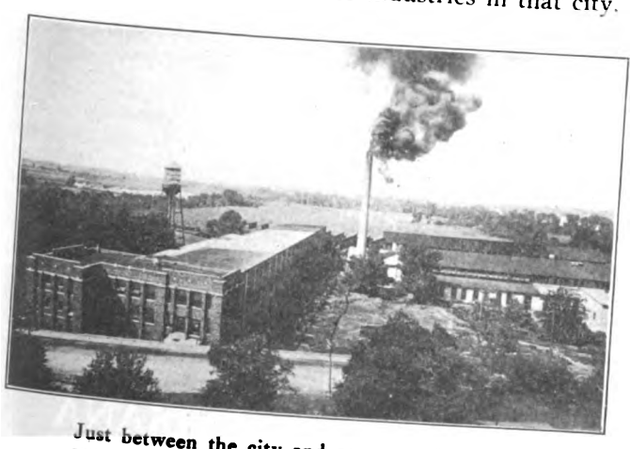
Looks like a toy village but it really is a view of Baltimore dwellings where home ownership leads the country.

"Oakland, Cal., was chosen for the western plant site," said James Traverse, vice-president, in a reply to a Minneapolis manufacturer writing him on branch-plant locations on the Coast, "because it is not only well geographically situated for the distribution of Shredded Wheat, but also because of the first-class living conditions for workmen and the practical industrial coöperation we were informed was given by the Chamber of Commerce and city officials to industries in that city.

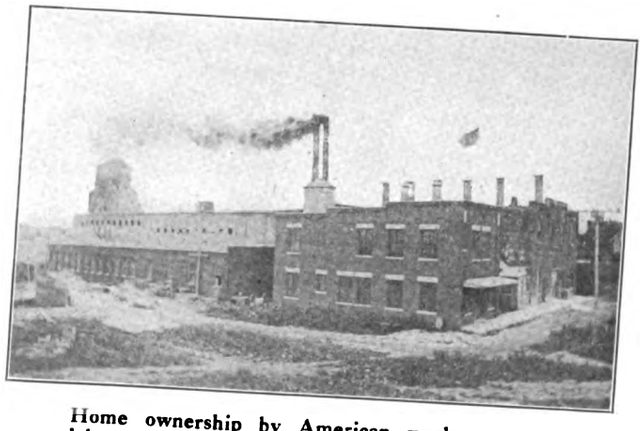
"We have found that the policy of the city, the banks, and building and loan organizations was to aid home-owning, the result being a large number of attractive home developments for workers who 'owned their own.' General education is not only high, but industrial education through technical high schools and chamber of commerce classes has made for an adequate supply of intelligent workmen. The city recreation policy and the park and lake system provide economical recreation. These living conditions and the fair and the reasonable attitude of the labor union heads I feel have some relation. Labor is willing to be fair when the community gives it a square deal."

The European location of Shredded Wheat is in the new garden city of Welwyn, a few miles out of London. A garden city is a scientifically planned industrial and home-owning community built on brand-new land, and surrounded by a country belt that provides both fresh, cheap food and recreation. Conditions here are clean and perfect for the production of this company's high-class product.

The significant movement of many industries to the small town has a reason, and that reason is well illustrated in what a machinery concern and a chemical manufacturer think of Hoopeston, Ill., as expressed by them to

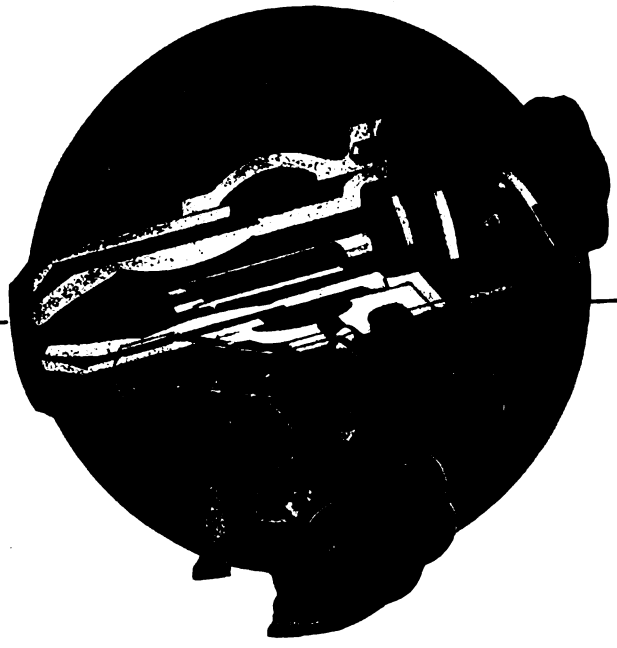


Just between the city and country with the advantages of both is the plant of the Gardne Governor Co., on the outskirts of Quincy, Ill.



Home ownership by American workers cuts labor turnover and inefficiency according to the Iliff-Bruff Chemical Co., of Hoopeston, Ill.

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Saving in furnace and burner repairs— $10.00 x 52 weeks	$520.00
Saving in power for air blower— 1,400 K.W.H. @ .015	21.00
Saving in oil— 450 gal. per week x 52 weeks x $.03	702.00
Total saving by 9 Hauck burners	$1,243.00

From Nielsen Survey No. 20

The HAUCK Burners proved so satisfactory in this plant—a large Mid-Western Manufacturing Company—using the burners on forging and welding furnaces, that repeat orders have been received from time to time. In a comparison with burners formerly used, HAUCK Burners have reduced fuel costs 34½%, which pays for the burners several times annually. Our engineers are ready to aid in your oil burner problems for:

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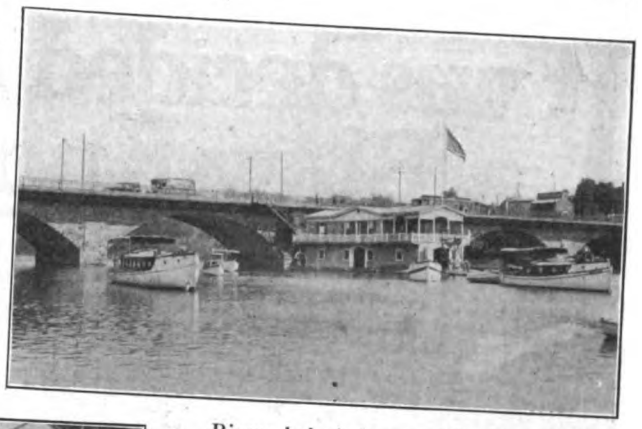
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This magnificent municipal bath house at Edgewater Park, Cleveland, is located in the very shadow of industry.



Rivers help industry. The Raritan at New Brunswick, N. J., is a water way utilized for both business and pleasure.

the Central Illinois Public Service Co., a public utility with an industrial department which coöperates with industry in its area for better local and power facilities:

"There are a great many advantages to a manufacturer producing a line of goods which is widely distributed, if he is located in a small town," says the Sprague-Sells Corporation, makers of canning machinery. "First, he is in close contact with his factory, at any hours of the day or night. Second, labor is more inclined to be of a permanent nature and labor turnover will be less and employees more loyal."

"In our city," states the Iliff-Bruff Chemical Co., "over 74% of the citizens own their own homes. This has a great effect on labor turnover. These homeowners are usually superior workmen and do not change jobs readily. In small towns, also, workers are mostly American born.

"We have found chambers of commerce in small towns appreciate the value of factories to a community, and are anxious and eager to coöperate in every possible way."



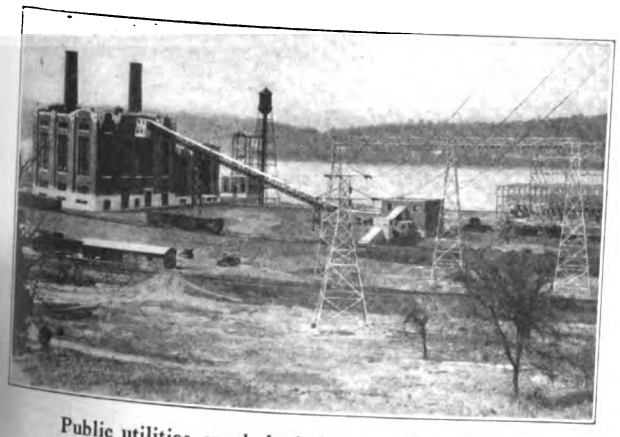
Baltimore's low food costs result from sea food fishermen like these, and eleven municipal markets for farm produce.

Baltimore is a city that in the practical things it is doing for industry, adds dividends and cuts costs for the manufacturers there. The fact that a workman may buy a modern six-room house with all improvements for a few hundred dollars down at a low total cost, or rent for $4 a room a month, and that the great municipal market system makes local food costs the cheapest of any of our large cities, has resulted in living conditions described by the president of the American Sugar Refining Company as "better than any other great city." The result is a labor efficiency which large manufacturers tell me is among the highest. The industrial space planning and the industrial financing system are both notable achievements.

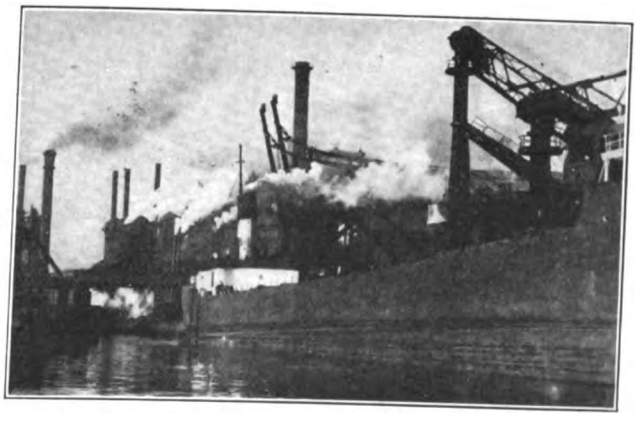


Nature soothes western workers. A typical week-end camp near Spokane, Wash., is shown in this picture.

Cleveland is not only a city of well-known industrial recreation, but the labor and personnel in-



Public utilities can help industry. This Mississippi River plant of the Central Illinois Public Service Company, works with and for the industries and towns in its area.



Cleveland plants find splendid water front facilities. Here is a lake freighter unloading through modern machinery.

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It was decided to purchase a Blaw-Knox Building



ATWOOD AND NASH, INC.
ARCHITECTS AND ENGINEERS

Chapel Hill, N. C.
February 10, 1925

Blaw-Knox Company,
Pittsburgh, Pennsylvania

Gentlemen: The requirement leading to the selection of the Blaw-Knox building for athletic purposes at the University of North Carolina was a most interesting development.

The university has for many years been attempting to develop intramural athletics with the idea of getting, as far as possible, every man engaged in some form of helpful exercise. Owing to the favorable climate, it is only for a few months that work must be conducted indoors. Nevertheless, for these few months, it was felt essential to provide a large covered floor on which such games as basket ball and track athletics could be carried on without interruption.

At the same time, it was not expected to build this in regular gymnasium style, nor was the money available.

The main essential was therefore, to provide an inexpensive building of reasonable permanence and with large floor area. The modern steel buildings seemed best to meet these requirements, and the writer was commissioned by the university to investigate the buildings made by various firms and to purchase one which seemed to meet all requirements in the greatest degree.

I visited several eastern cities to look over buildings which had been erected for several years and to inspect them, and also to get the ideas of the owners regarding them. As a result of these trips, it was decided to purchase a Blaw-Knox building 300 feet long by 110 feet wide with unobstructed central bay 60 feet wide and 20 feet high in which five games of basket ball could be played simultaneously; and with two side bays 25 feet wide which could be used for running, baseball practice, or other similar work. A large number of skylights were placed in the roof giving the uniform lighting very necessary in such a building.

The construction of this building has given a tremendous impetus to general athletics, and is regarded by university authorities as an excellent investment, as it gives a very large floor area at small unit cost.

It was never expected that this building would take the place of a regular gymnasium. It does, however, fulfill its purpose, that of a useful adjunct to the gymnasium, in providing a large floor space in very economical construction where a large number of men can work at once.

Very truly yours,

T. C. ATWOOD

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Time tells the story—thousands of **leakproof** skylights, like those shown in the illustration, are now in use from Canada to Mexico and from Maine to California—furnishing evidence of perfect service and economy, **time-tested** under all climatic conditions.

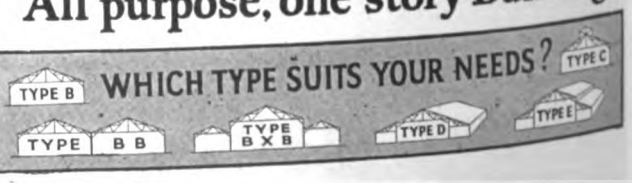
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formation furnished by its Chamber of Commerce, giving periodic data on wage-rates, employment in leading local industries, average hours worked, cost of living, and an active policy in labor arbitration, is a valuable aid to uninterrupted production in that city.



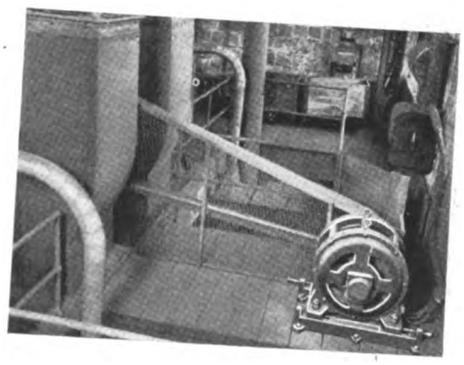
The Coca-Cola building in Baltimore is an example of a bee-hive of industry. Numerous small concerns lease space, light, heat and power.

Executives go to school again in the industrial management Council of the Boston Chamber of Commerce. Its motto is "Give us good management and most of the problems will be solved." Members visit various plants for first-hand observation, and have groups on such subjects as Industrial Planning, Ordering and Preparation of Raw Materials, Stock Keeping Systems, Financing and Purchasing, Balance Sheets, and Profit and Loss Statements, etc.



The Sprague-Sells Corporation of Hoopeston, Ill., prefers a small town because executives and workers take more local pride in their plant.

All in all, industry need not fight alone. In an increasing number, our communities are getting together with industry to solve problems that no individual concern can hope to master—problems whether of the movement of goods or of the lives of men, that vitally affect the profit-and-loss statement.



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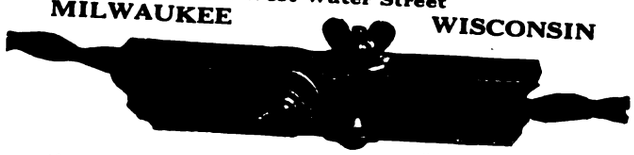
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American Fixture Company

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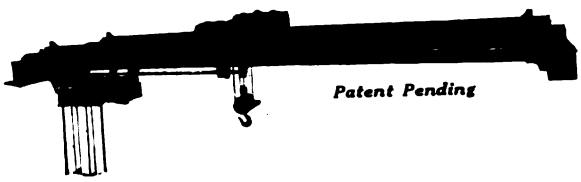
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Locate your Storage Piles where it is most efficient to have them—

Several cars are shunted on your spur. Your coal or raw materials have come in. Thus far materials have cost you so much in dollars and cents. Now comes the handling to storage piles—*what is that costing you?* Don't allow inefficient materials handling methods to swell plant operation costs.

Locate your storage piles where it is most efficient to have them—coal in your bins close to the boiler room, raw materials close to the first step in your manufacturing process. Chicago Automatic Conveyors will get it there from the cars at the lowest possible cost. The illustration shows a splendid example of how many manufacturers convey materials, even hundreds of feet, to storage piles, with Chicago Automatic Conveyors, requiring only a few men—a considerably less labor gang than would be required by other methods.

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Our catalog illustrates and describes a most diversified line of automatic conveying equipment, all steel built in bucket, belt and drag types. Tear out this advertisement and put it with your correspondence to be answered immediately.



Chicago Automatic Conveyor Co
982 Old Colony Bldg., Chicago, Ill.

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A Truck Literally "Fully Equipped"

This Outfit is Really a Moving Industrial Plant

By Charles W. Geiger

THE adaptation of the motor truck to special uses has reached a high point in the vehicle shown in the accompanying photos. The truck carries a twin cylinder air compressor, operated by a belt from the forward drive shaft; a rotary concrete mixer, driven by an auxiliary shaft from the transmission; a 150 gallon steel water tank; a tar or road oil heating tank with a capacity of 50 gallons and heated by a gasoline burner arranged under the tank; a large pneumatic jack hammer, with assorted chisels, tampers, etc.; a pneumatic post hole digger, for use in erecting fences along the highway; a large grading plow, drag and an extension side arm or boom from the front of the truck for grading. The water tank can be filled by means of a centrifugal pump provided with a self-priming device and a suction hose.

In addition to the above mentioned equipment, the truck has a combination material bin, with capacities of 1,000 lbs. cement, one cubic yard sand and two cubic yards gravel or rock. Gravity feed from all the bins is controlled by hand operated gates to the mixing apron. There is also a draw bar attachment on the rear of the truck for hauling trailers or for operating the grading plow, and a syphon for spraying hot tar or oil.

There is a special paint spray outfit and steel stencils for stenciling traffic or ordinance signs on streets or highways. The chipping gun can be used for chipping out cracks on concrete highways and the pressure nozzle used for sealing the openings with hot tar. Pneumatic jack hammers are used in breaking up concrete macadam or other forms of streets or highways.

Asphalt paving can be cut with pneumatic chisels or jack hammer when excavating for sewer pipes, underground conduits, etc. Excavations can be properly tamped by tools provided and surface of streets covered with asphaltum and rolled. Tar tank can be used to keep asphaltum hot.

By using the water tank filled with fungicide and high pressure fog guns with air hose, trees and shrubbery in parks and along highways can be sprayed.

The suction hose and centrifugal pump can be used to good advantage in pumping out caissons in sewer or bridge construction, relieving flooded highways and for other uses.

Beveling, grading, shouldering up, rolling or draining right-of-way along highways can be done by use of the grading plow attached to the extension side arm, also using the grader and steel roller tire on rear wheel.

The equipment can also be used in putting out fires along highways especially grain fires, which burn down fencing, using tank filled with chemical and high pressure through special nozzle.

This equipment is being used by the San Diego Electric Railway and by Kern County, California.



The air compressor on this truck serves many purposes, such as digging post holes, operating hammers, chisels, tampers, etc.



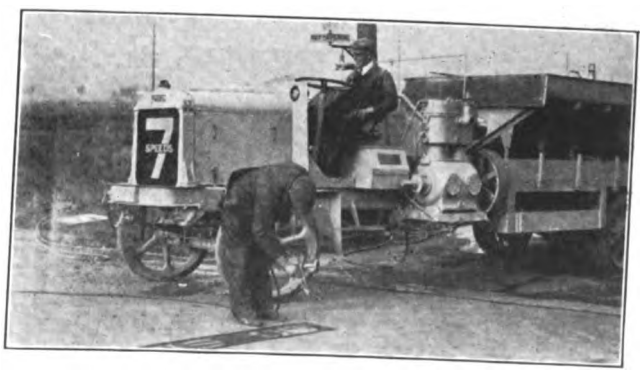
The concrete mixer is clearly shown in this photograph. In the foreground the pneumatic chisel is cutting through concrete.



A rotary pump renders first aid to flooded highways or pumps water for mixing concrete.



A plow, a compressed air tank, a tar heating tank, and the rotary pump can be seen in this picture.



Stenciling traffic signs on streets by means of a paint sprayer, is one of the odd jobs of this equipment.

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Modern Jobbing Practice in the Manufacture of Special Bolts

By Arthur L. Greene

BOLT and nut manufacturing is regarded as one of the most highly intensified industries using automatic and semi-automatic machinery. In consequence, few appreciate the important part played by the jobbing department in this phase of industrial activity.

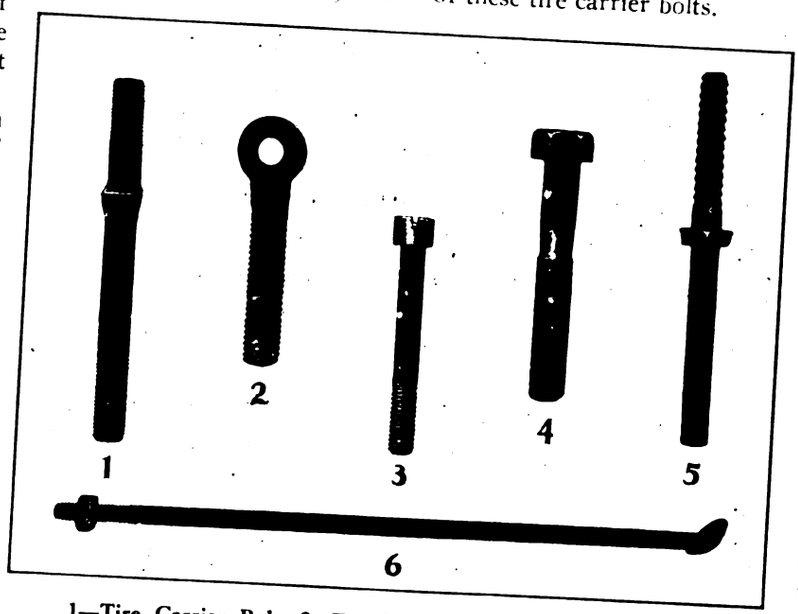
Improvements made in bolt and nut manufacturing processes have made possible a very extensive use of automatic and semi-automatic machinery.

When special bolts, such as those illustrated, are considered, however, conditions are invariably encountered which make employment of jobbing methods necessary. In fact the manufacture of special bolts (and nuts) constitutes over 50% of the business of the average bolt and nut manufacturing plant.

The use of the term "jobbing department" here means simply that department where finishing operations on the bolt are performed, such as milling and threading operations. It does not include special heading operations; this latter comes logically under the designation of forging operations.

The tire carrier bolt first shown has a U. S. standard thread incorporated at both ends; in the blank part of the bolt barrel is a square upset section with angular sides. Automatic or semi-automatic threading machines cannot be employed here because the design of the bolt is such that no means is provided for holding the bolt in the automatic feed device. A "general purpose" machine must therefore be employed for threading operations. These machines are known as two spindle, hand threaders, and one operator is required for each machine.

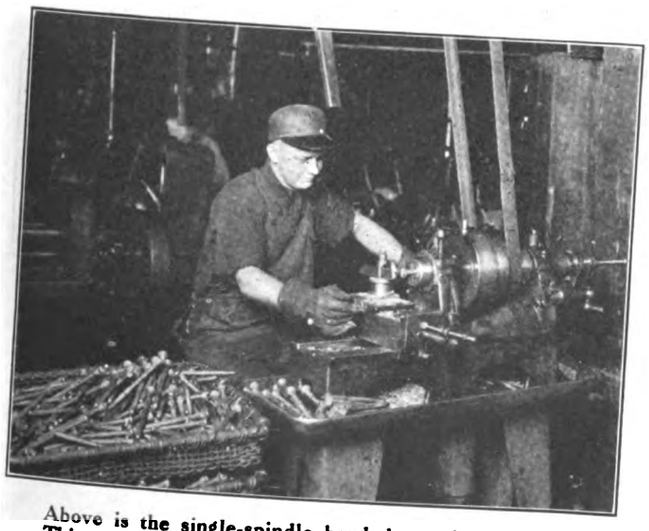
Threading operations here are rapid. In a 9 2/3 hour working day, for example, at the plant of the Buffalo Bolt Company of North Tonawanda, New York, one operator will thread both ends of approximately 4,000 of these tire carrier bolts.



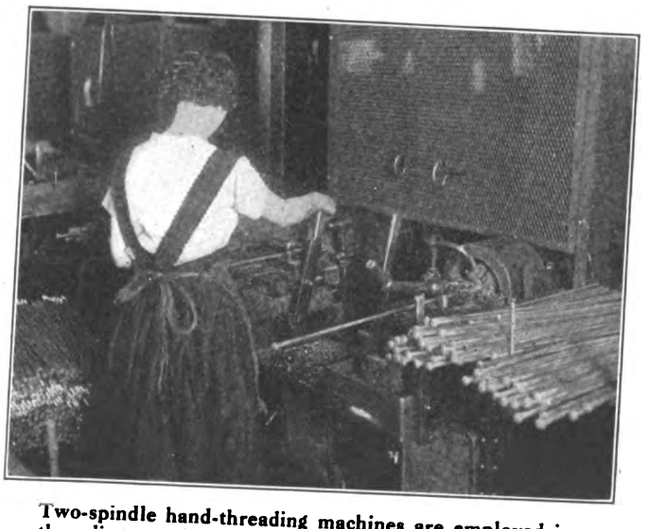
1—Tire Carrier Bolt, 2—Eye Bolt, 3—Slotted Fillister Head Bolt, 4—Plain Hexagon Head Bolt with Relieved Barrel Section, 5—Beater Pin, 6—Rod with Angular Offset Head.

The eye bolt shown next, because of the type of head, cannot be handled in an automatic or semi-automatic machine. Therefore, the threading operation is done in the jobbing department. Output of the two spindle threaders in this instance, due to the greater length of thread and the large diameter of bolt will total about 2,500 per day.

The procedure followed in threading the third bolt—a slotted fillister head bolt—is essentially the same as in the first instance.



Above is the single-spindle head-shaver in operation. This machine is used for milling special bolt heads to size.



Two-spindle hand-threading machines are employed in threading special bolts which cannot be put through automatic or semi-automatic threaders.

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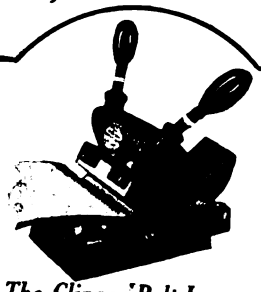
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Above is a battery of two spindle hand threaders operating on radiator rods. Note the convenient location of rod racks for rough and finished stock.

Here, however, only one end of the bolt is threaded. Preceding threading operations, the head is milled to exact size in a single spindle head shaver machine. Next, the bolts are taken to the two spindle threading machines. The threading capacity, however, is greater due to the fact that only one end is threaded. Production for this operation totals between 5,000 and 6,000 bolts per day. Next the bolts are taken to a group of automatic slotting machines where the heads are slotted.

Number 4 shows a plain, hexagon headed bolt. The special features here necessitating a jobbing process are the relieved section of the barrel, and the facing of the under side of the head. The threading operation itself could be performed on an automatic machine, if desired, rather than on the hand machine. In an instance of this kind, therefore, the quantity of the product ordered determines the choice of threading machine. In this case the quantity wanted was too small to warrant employment of the automatic threaders. The jobbing operations consisted of first milling the under side of the bolt head, and then relieving the barrel section. The final operation was that of threading, performed at the rate of 2,500 bolts per machine per day.

The next bolt, known as a beater pin, is employed in the construction of threshing machines. The section just above the thread is upset in the form of a square neck having a round, flanged base. The thread is of the ratchet type rather than of the ordinary U. S. standard or "V" type. The incorporation of this upset section has again made impossible the employment of automatic or semi-automatic machines. The threading now becomes a simple operation. Again, due to the coarser type of thread employed, production capacity is increased over the last named bolt (the hexagon headed bolt) by 500 pieces per day. No special tools are required for cutting this type of thread.

It is obviously impossible to employ automatic or semi-automatic machines in the threading of the bolt numbered "6," due to the length of the rod and the angle of the offset section. This rod is of small diameter and has incorporated a short thread of the U. S. standard type. Threading operations therefore are rapid as can be noted from the production figures totaling approximately 5,000 rods per machine in a 9 2/3 hour working day. The threading of the end is the only operation performed in the jobbing department.

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The Where and When of Grease Lubrication—II

By Allen F. Brewer

HAVING gained an insight into the "where and when of grease lubrication" as brought out in a previous article, the matter of the essential characteristics and advantages which qualify such products as lubricants will require consideration. In fact, to the engineer these points are quite as informative as a knowledge of the operating conditions which warrant the use of greases.



Fig. 1. The lubrication of mine cars is an important matter. Above is indicated a means whereby grease is forced into the wheel bearings under pressure.

Greases, as most usually understood, are intimate emulsions of mineral oils and soaps, of a consistency ranging from relative fluidity to a semi-solid (or in some cases practically solid) state. Properly compounded greases should be homogeneous in appearance and of uniform lubricating ability, the oil being entrained in the soap for example, in much the same way that linseed oil is absorbed by kneaded putty.

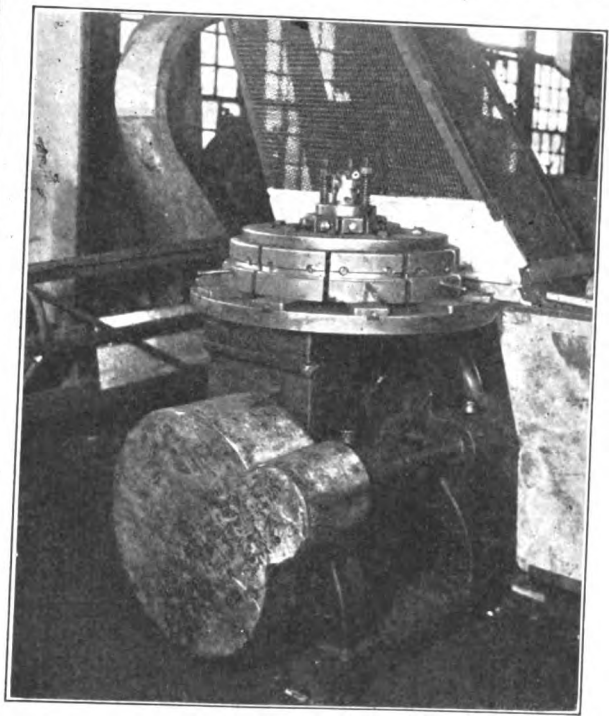


Fig. 2. A vulcanizer in a rubber mill provided with grease cups on the pinion shaft. The temperatures may often be high enough to preclude effective lubrication with oil.

The making of greases is a science, and the producer must be both chemist and grease-maker if he is to succeed as a judge of color, gloss, texture and consistency, the characteristics which are practically invaluable to the producer in manufacturing greases which will adequately meet the requirements. "Rules of thumb" cannot be followed in the grease house; too many contingencies are involved. For example, it is possible to take two batches of grease containing the same ingredients and turn out finished products of decidedly different characteristics. Another odd possibility is the fact that the same mixture can be divided, put into separate kettles and heated alike, yet one will be fluid and the other relatively hard. So it can be appreciated that grease making is not simply a matter of stirring, mixing, heating and pouring; the product must be sampled frequently and carefully inspected. Too much or too little heat, the time or the rate of adding the oil, etc., are but examples of details which might easily govern the appearance and suitability of the finished product. To the grease-maker, however, it is not a mystery. He reads the signs from his many little scoops or samples, and controls the heating, mixing or stirring of his batch thereby.

Likewise, the matter of grease lubrication is distinctive and worthy of the utmost consideration. In the operation of mechanical equipment it occupies quite as important a position as does oil lubrication, notwithstanding the fact that the two are interchangeable to a more or less extent. Essentially the problem is a question of:

1. Deciding once and for all that the conditions require grease lubrication, that power consumption and repair bills will be decreased, and that production will be increased. And

2. Selecting a grade or grades of grease which will be bright, lustrous, smooth, not liable to separate, and adaptable from a physical point of view, to the operating conditions and constructional details of the equipment on which they are to be used.

In connection with this subject of grease lubrication, it will be of decided interest to look into just what the advantages are in its use as a lubricant. This, of course, involves

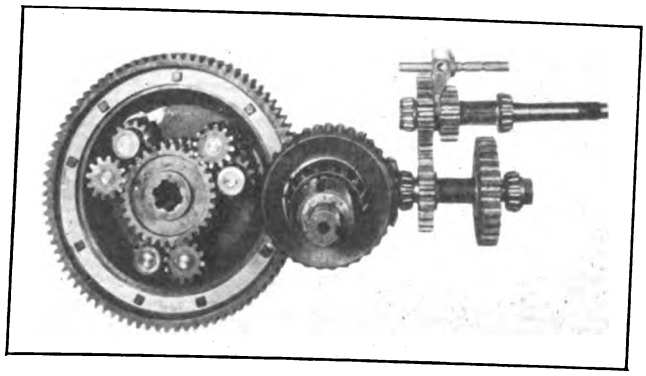
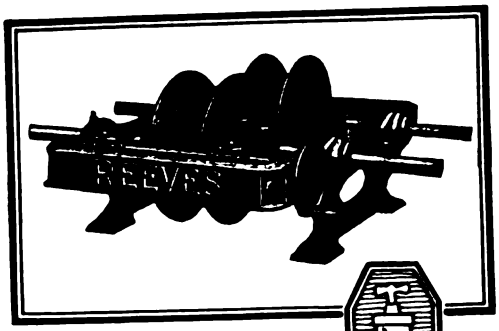


Fig. 3. Grease is oftentimes an admirable lubricant for tapered roller bearings. Note above the gear assembly with the appertaining bearings as installed in a road roller.

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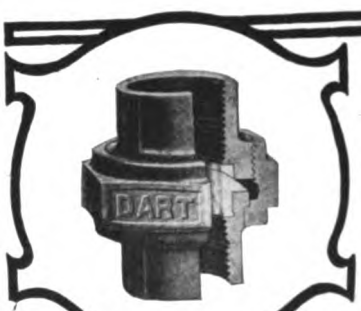
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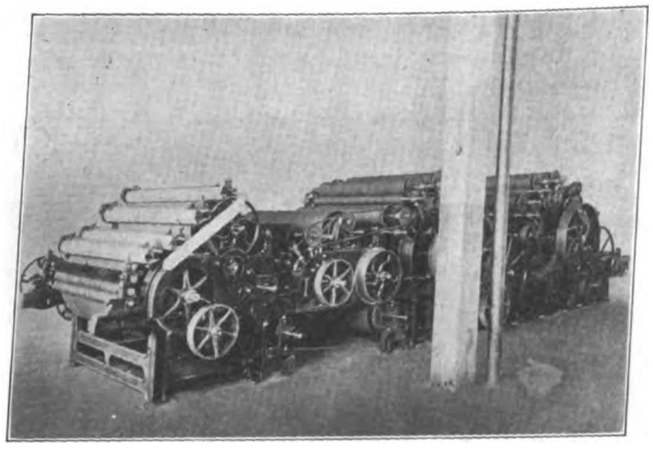


Fig. 4. In the textile industry, on the carding machine it may be advisable to use grease as a lubricant, especially where wearing parts are adjacent to the product, or where a heavier film of lubricant is desired.

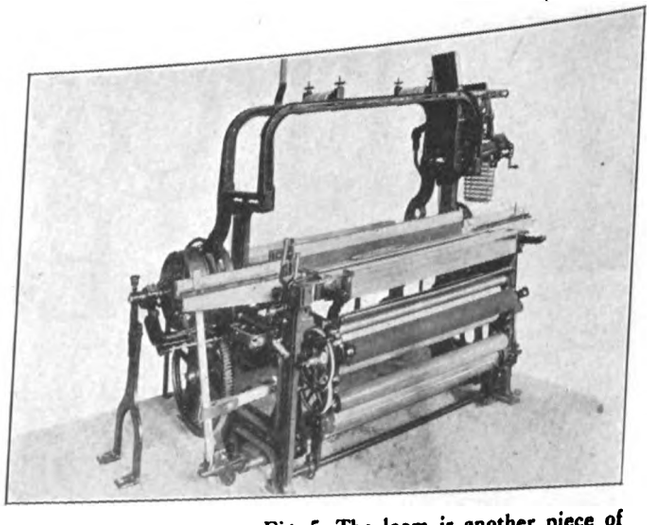


Fig. 5. The loom is another piece of textile equipment where care must be observed in the application of lubricant. Oil spots are objectionable, and must be guarded against as much as possible.

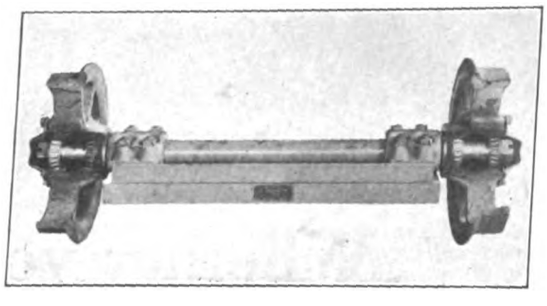


Fig. 6. An installation of roller bearings on mine car wheels. The arrangement of these and the manner of housing to prevent excess of leakage is plainly shown.

a comparison with fluid oils for the same purposes. In making such a comparison it is essential that prior consideration be given to constructional and operating conditions of the machinery involved and the ability of each type of lubricant to meet the conditions. As a result we should not only have an intimate knowledge of machine design, but also an insight into the science of lubrication.

In general greases will be best adapted to low speed operation, higher clearances and pressures; in other words wherever it will be necessary to form and maintain a lubricating film of considerable thickness and an ability to resist the squeezing out action which would be brought about by operating pressure. It is claimed by certain authorities that the resistance to shear in a grease film is probably less than it would be in an oil film under similar conditions. In other words probably less power would have to be consumed in overcoming the internal friction in the lubricant. Whether this would hold true under high operating speeds or not is, however, oftentimes a matter of contention. In any event grease lubrication may be said to be decidedly advantageous and economical wherever it is essential to protect products from splashed or dripped lubricants.

Of the so-called semi-solid lubricants, mineral oil—soap products will be most generally used where it is necessary or desirable to use a more inert lubricant than fluid oil. Broadly speaking, they can be classified as either hot mixed or cold mixed products according to the time and manner in which the chemical action takes place. On the whole, they include what are known today as compression cup and sponge greases, axle and railroad greases and the several varieties of non-fluid oils or liquid greases which are so generally known.



Fig. 7. An arrangement of textile washers, bringing out the conditions to which the lubricant will often be subjected. Grease is often the most adaptable lubricant, due to its resistance to water and ability to withstand higher temperatures.

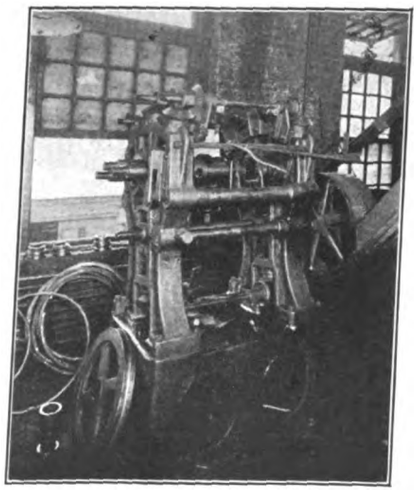


Fig. 8. Wherever exposed gears and plain bearings are involved, grease will oftentimes be the most economical and adaptable lubricant.

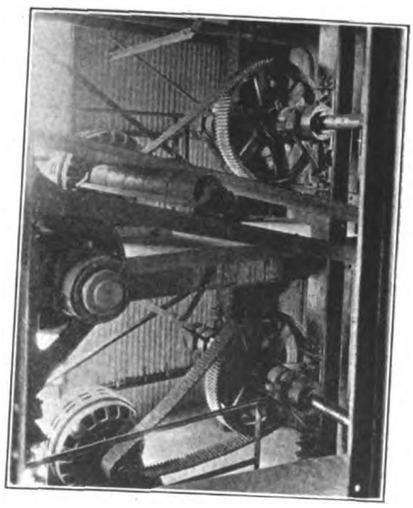


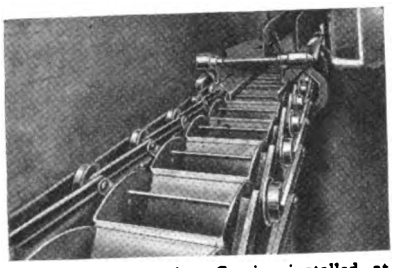
Fig. 9. Elevator mechanisms require careful and positive lubrication. In many cases a grease is the most satisfactory product due to the inaccessibility of the parts.

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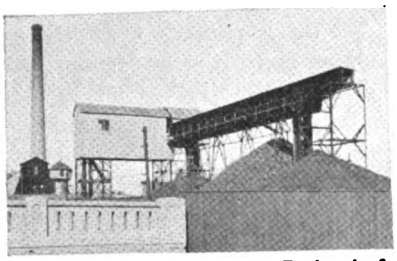
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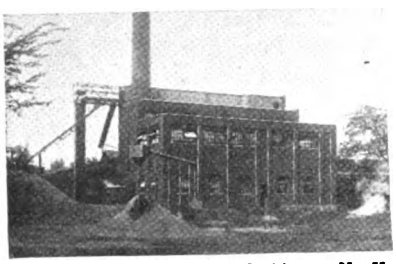
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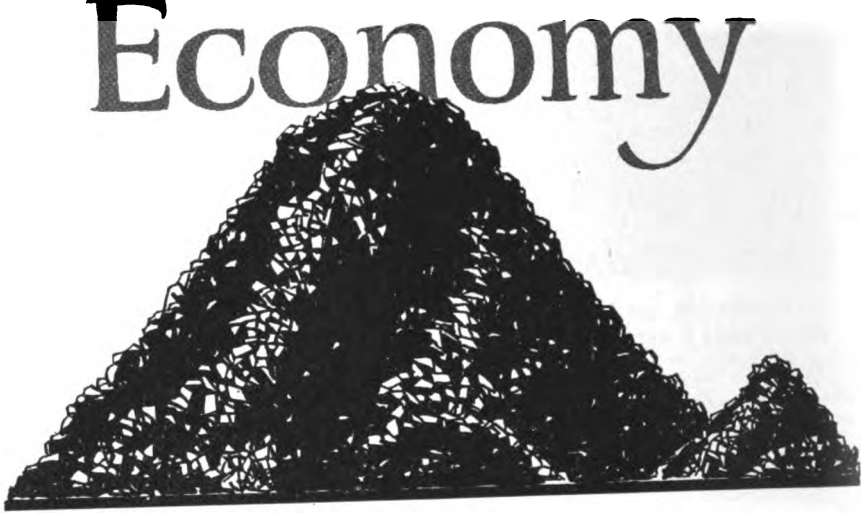
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The grade and amount of soap which is used will have a decided effect upon the general appearance, inertness or body, and other physical characteristics of any grease. For example the use of a certain amount of horse oil in a batch of cup grease will give a finished product of higher melting point than otherwise and a very desirable degree of smoothness though the odor may be somewhat objectionable. Then again, the alkali which has been used to bring about saponification is an important point, inasmuch as it will indicate whether the resultant grease will be soluble in water or not. Greases which are made from lime soap as a general rule will be insoluble in water. They can further be identified by their smoothness to the touch.

Sponge greases, on the other hand, are generally made up of soda soap. These latter are soluble in water, therefore, the grease itself should not be used under water conditions. Products of this nature can furthermore be generally identified by their fibrous nature and their ability to cling together. By virtue of this characteristic they are advantageous for the lubrication of exposed parts where a tenacious lubricating film must be maintained and the action of centrifugal force resisted as much as possible.

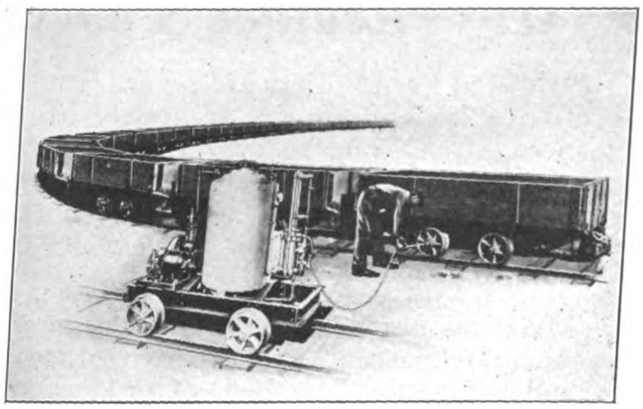


Fig. 10. A portable grease appliance for the lubrication of mine car wheel bearings. The ease with which this can be carried out is readily appreciated.

It is also important in the preparation of greases that every care be given to the selection of the mineral oil constituent. We must remember that whatever the nature of the soap used, a grease is seldom better than the mineral oil which it contains. In fact, as stated, the soap serves merely as a carrier, the lubricating value of the resultant product depending largely upon the lubricating value of the oil.

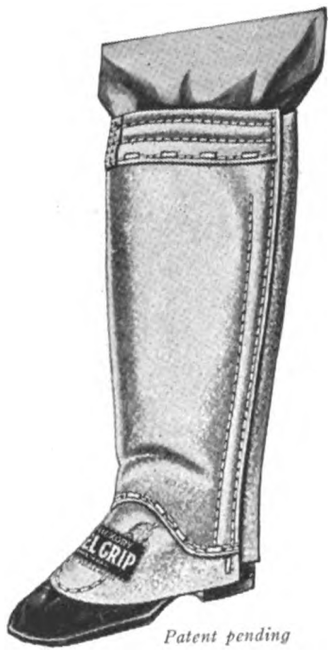
To best serve the intended purpose greases should possess:

1. As low a separation tendency as possible, during both operations, and over extended periods of storage. Separation, of course, seriously impairs a grease as a lubricant, therefore, the constituents should remain perfectly mixed. Separation is in many cases the result of the use of excess heat in the mixing process, in the attempt to brighten the product.

2. Freedom from fillers of a non-lubricating nature, such as talc, chalk, soapstone, etc. These are generally used to increase the viscosity or body; they often will contain grit and abrasive matter to such an extent as to score bearings to a serious degree.

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(1) Positive Safety—maintains its correct position—does not climb up the leg when stooping or walking.

(2) Positive comfort.—New construction plus lining; gives perfect fit.

(3) Positive flexibility,—an assured guarantee of points one and two.

(4) Positive protection for the shoe. Its flare is form fitting and non-curling.

(5) Positive endurance.—Assured by use of special test raw materials.

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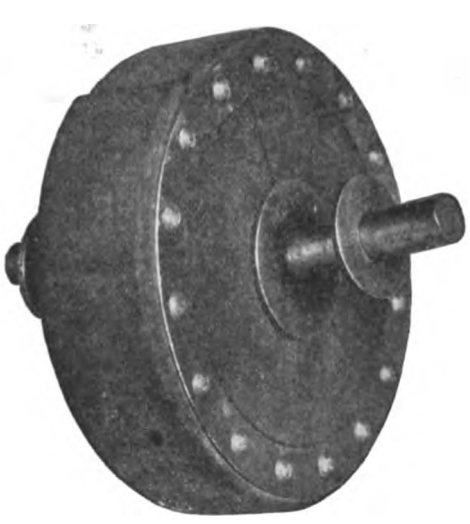
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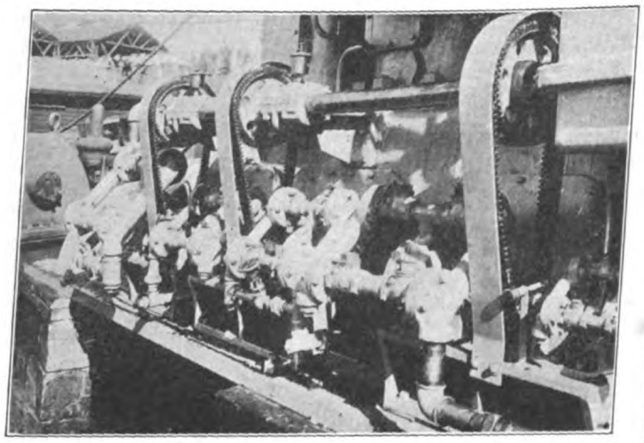


Fig. 11. Grease is also adaptable for the lubrication of certain of the external wearing parts of the oil engine, just as it is for exposed driving chains, and certain of the gears and sprockets.

3. Adequate body or consistency to insure the maintenance of a suitable film between the wearing parts, and effective resistance to the "squeezing out" action which might be brought about by abnormal operating pressure.

4. A melting point in conformation with the operating temperature which is to be encountered.

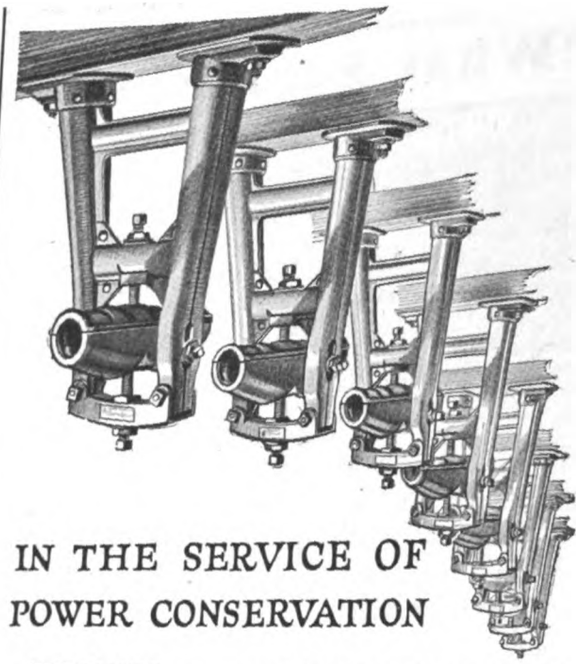
5. As perfect homogeneity as possible, a minimum of lumps and a uniform consistency; otherwise, there would be considerable probability of the lubricator or oil ducts becoming clogged. Unless a grease has been skillfully mixed there will often be a tendency towards separation of the soap from the oil content. Frequently this will be indicated by a lumpy appearance.

6. A minimum tendency towards decomposition, oxidation or rancidity when exposed to the air for any length of time, either in the lubricator or during storage.

7. A smooth, plastic appearance, for this indicates the proper content of water. A rubbery appearance is a sign that too little water has been used in compounding. Under such conditions oil will frequently separate out from the soap content during storage or inactivity.

As a result, we can appreciate that the usage of grease as a lubricant is of decided importance to industry as a whole. In fact, it is so important that all concerned will do well to look into the points which may govern its usage. There will be many cases where operators will prefer oil to grease or vice versa, according to the ease of handling, without any regard whatsoever as to the adaptability to the conditions involved. These are conditions where an impartial executive or engineer with a general working knowledge of grease, its characteristics and advantages, will be able to effect marked improvement in power economy and machine efficiency. It will be of advantage, therefore, for all to study this matter of grease lubrication most carefully.

COMPETITION within the oil and automobile industries, which have prospered during the first half of the year, marks a somewhat pronounced development in business affairs. Price cutting in the oil industry has provoked comment inasmuch as it comes at a time of peak seasonal demand. The price revision by automobile manufacturers was felt to be inevitable as a necessary prerequisite to the maintenance of quantity production.—*Industrial News Survey.*



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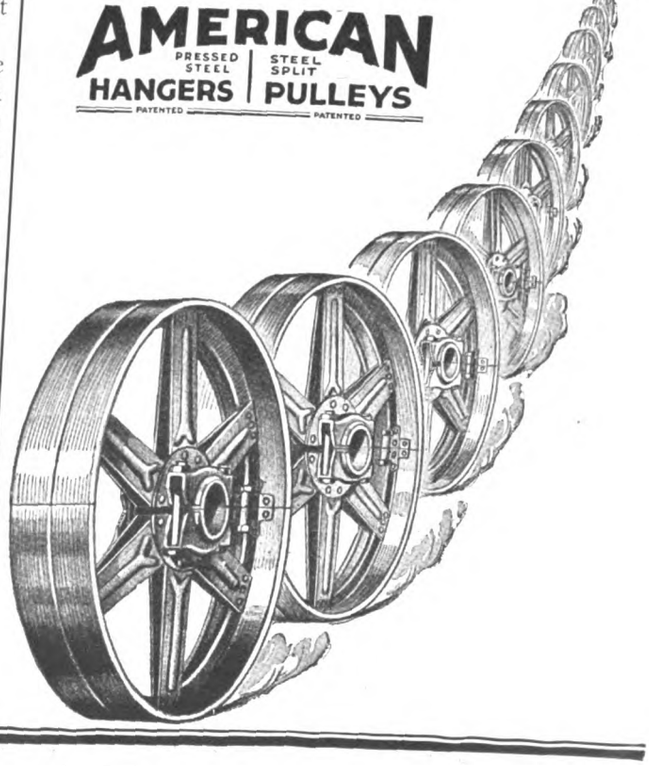
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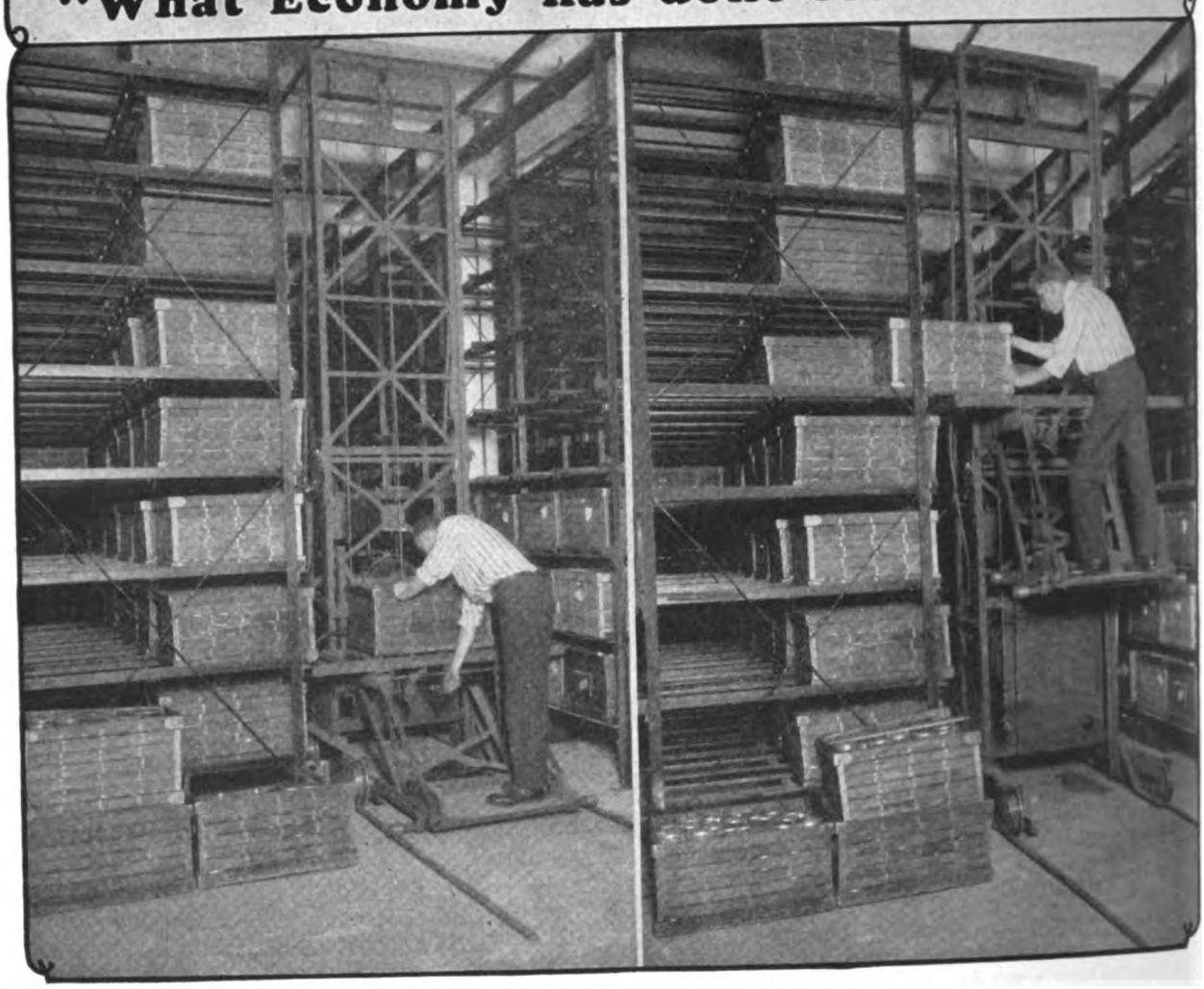
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September, 1925

Modern Protection of Furnace Walls

How to Prolong the Life of the Fire Box

By Francis Juraschek

THE hardest task confronting the power plant engineer is the job of balancing efficiency and maintenance. On the one hand are the incessant demands for more power at lower cost, which today usually means operation at excess ratings. On the other hand is the constant cry of the executive who O. K.'s the bills, "why must so much money be spent for furnace repairs?"

It is sad, but true, that fire is one of the most destructive things known to mankind. And the hotter the fire, the greater the havoc it wreaks. But fires must burn, and burn hotly, to make steam; and furnace repairs continue to be made as fast as the fire burns out the firebox walls; while the engineer groans and takes abuse.

Until someone kindly suggests that he give a thought to the interesting subject of Refractories!

It is a very remarkable thing to consider how many industrial executives look on boiler furnace walls as nothing more than a mass of brickwork. It is even more remarkable to consider how many of their otherwise competent and hard-working engineers think that the same kind of furnace walls which were efficient under the low operating conditions of a quarter of a century ago are still good enough for the increased demands of today.

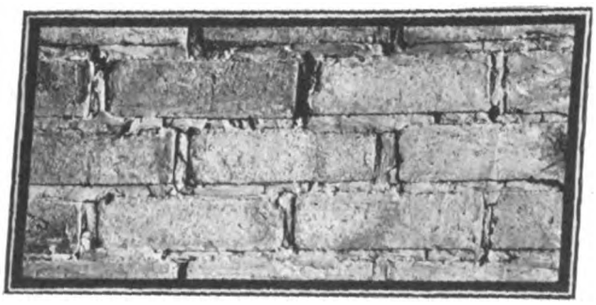


Fig. 1. Fireclay joints shrink when subjected to heat, leaving the sharp edges of the brickwork unprotected. Spalling and cracking of the sharp edges of the bricks then start, and soon the joints are cracked open.

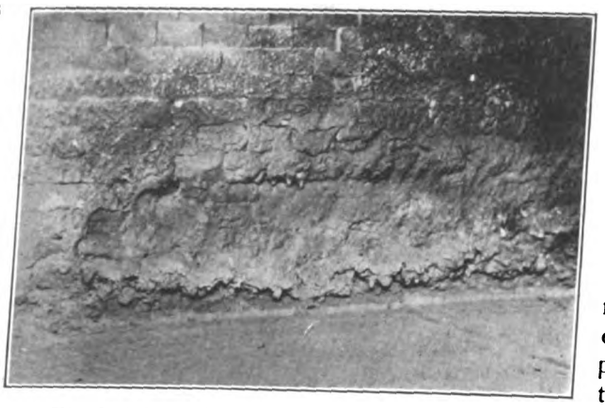


Fig. 2. A horrible example of the action of flame on fireclay joints and brickwork. The wall immediately adjacent to the fuel bed has melted, while the joints higher up have lost most of their mortar.

For the boiler operating conditions prevailing today demand intelligent consideration of the *materials* used in the furnace walls as well as the combustion design of the firebox, if maintenance costs are to be kept within reason. The subject of furnace design has received much attention of late; yet with improved design the same shaped sidewalls, arches and baffles may show high or low maintenance costs depending entirely on the materials of which they are composed.

These materials may be grouped generally under the term "refractories," for their value to the power plant engineer depends on their ability to withstand obdurately the destructive effects of high temperatures.

Look into the rapacious maw of a modern, high-powered boiler furnace (with a pair of tinted glasses on to protect your eyes from the fierce glare) and you will wonder that any material can be found in the world that will withstand the all-devouring flames.

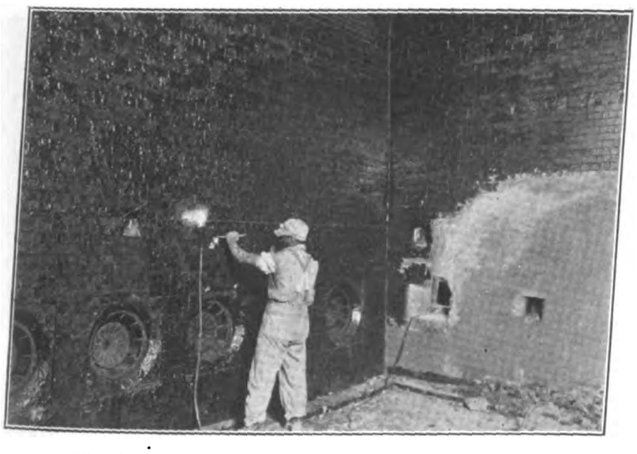


Fig. 3. This is an oil-fired furnace in which the walls are well-burned. A protective refractory lining is being applied, the joints being first raked out and the brickwork well scarified, so that the plastic will bond securely.

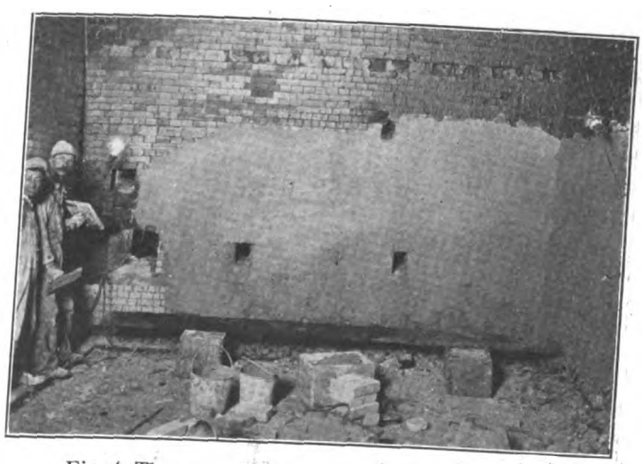
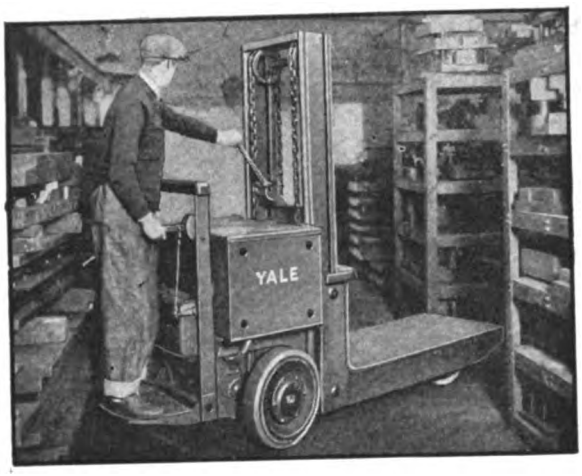


Fig. 4. The same furnace, showing how the plastic refractory is being troweled on. Under these conditions, the refractory is applied about ¼ inch thick, and of the consistency of thick plaster.

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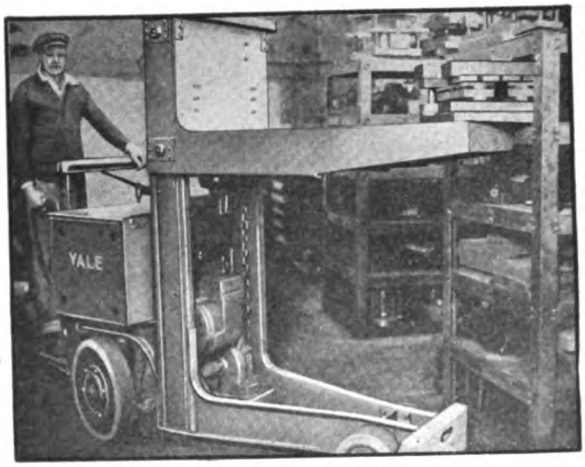




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Fig. 5. A patch being made in a badly burned bridewall. Three materials are visible here; the common brick in the back, the fire-brick in refractory cement in front of that, and the monolithic lining over the fire-brick.

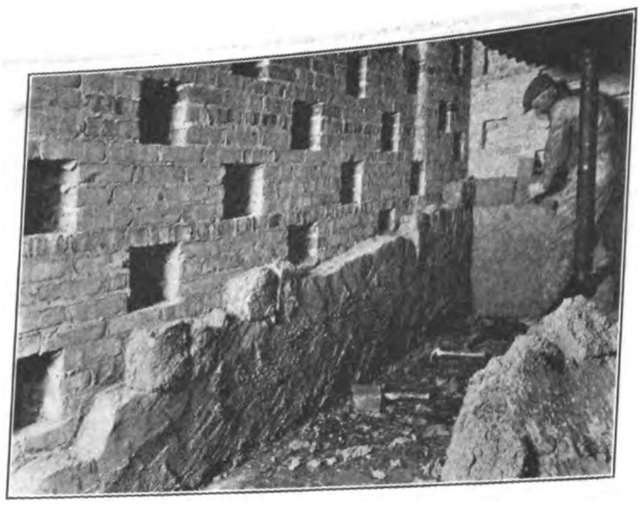


Fig. 6. For monolithic refractory linings of the heavy plastic type, openings are left in the brick wall at regular intervals to insure a good bond. This type refractory is pounded in place with a mallet and is used very thick.

Look into that same furnace when the fire has been drawn, and notice how the brickwork has actually melted and flowed where it has been in contact with the incandescent fuel bed; how the joints above have shrunk and lost their mortar, with perhaps here and there a few bricks actually fallen out of the wall. What can be done about it?

Several things can be done. And as proof of this statement, ponder this fact: The average life of a well-built firebox should be about 18 months. Many instances are on record of furnace walls lasting two and three times that length of time without repairs, but on the other hand thousands of furnaces are partially or entirely rebuilt within one to eight months. With such a wide variation in life, under fairly similar operating conditions, it is reasonable to assume that where long life is found, there the subject of refractories is understood.

A great deal of very practical knowledge on the subject of refractories has been adapted of late years from the researches of the metallurgists. They have found that all refractories may be divided into three groups according to their chemical constituents:

1. Acid refractories, which have an attraction or combining effect with basic substances when subjected to high temperatures,
2. Basic refractories which combine under similar conditions with acid substances, and
3. Neutral refractories, which are chemically inert.

Fuel ash contains both acid and basic constituents, varying according to the grade and the district in which it is mined. Fusion is the result of the chemical combination under the influence of heat of the acid constituents of a refractory with the basic constituents of fuel ash, or vice versa; and the fusion lowers the normal melting points of both the refractory and the ash.

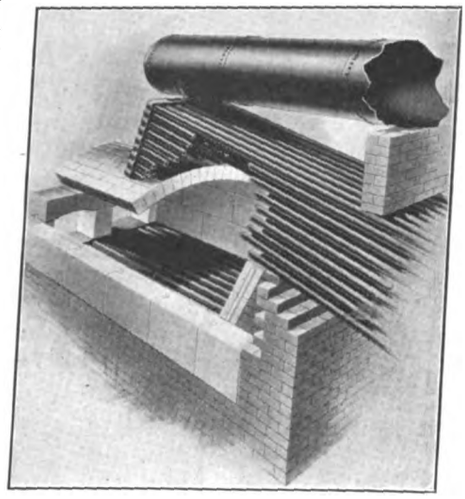


Fig. 7. A special type of refractory mixture moulded into interlocking blocks, and well adapted to small furnace walls. Note the special forms in sidewalls, arch, bridgewalls, and around the furnace doors.

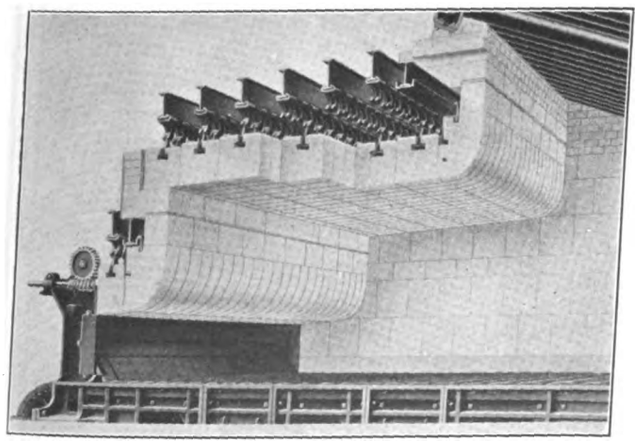


Fig. 8. A special form of refractory tile makes up this ignition arch for large furnaces. A feature of advantage is that any badly burned tile may be taken out and a new tile inserted without tearing down the whole wall.

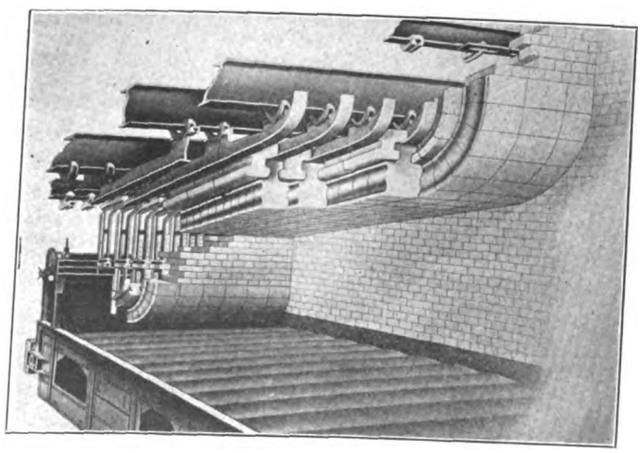


Fig. 9. Another design of individually hung, removable refractory tile in an ignition arch. The interlocking shape of the tiles makes a very tight arch construction of exceptionally long life.

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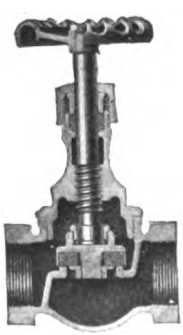


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Sectional view, Fig. 106, screwed, Jenkins Standard Bronze Globe Valve.

—is a characteristic of every genuine Jenkins Valve.

Note, in the sectional view, the distribution of metal throughout the valve. There are no weak parts, and all parts subjected to service are built with an extra thickness.

The design is only one of many reasons for the high standard of performance set by Jenkins Valves. Use of only analyses-proved metals, and a system of rigid testing are other reasons.

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Let one of our men come in to your plant and explain the real economy of a paint that cuts out the cost of frequently repainting.

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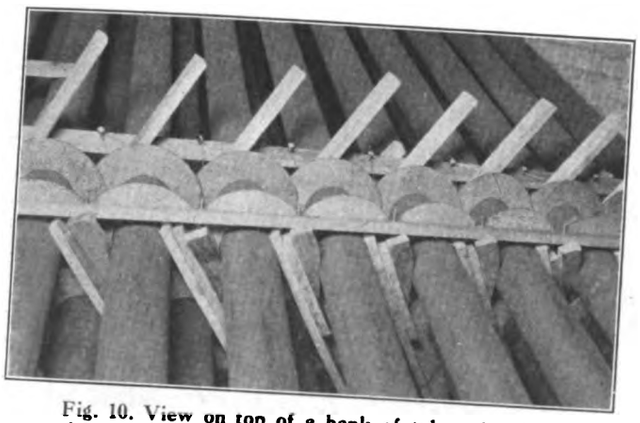


Fig. 10. View on top of a bank of tubes showing the construction required for pouring monolithic baffles. The paper washers fit snugly around each tube. These washers and the wooden supports are burned off in the first fire.

It would seem, therefore, that neutral refractories should be used exclusively, to avoid this fusion, which is exceedingly destructive in its effect on the furnace wall; but neutral refractories have been found to contain so little plastic properties that an admixture of at least twenty-five per cent. of the more plastic acid or basic refractories are necessary to permit any "working" or moulding of the neutral refractories at all.

So one point to consider in the selection of the proper refractories for your furnace walls is the selection of a type that will not readily fuse with the ash of the fuel you use.

But refractories do not generally fail first by melting. They more often disintegrate because of the unequal expansion of brick thoroughly burned and shrunk before placing in the wall, and mortar in which the burning and shrinkage takes place after the wall is built.

To overcome this requires careful thought. Very thin joints and special types of refractories used in the cement mortar make one solution of this problem; the T-joint developed by Johns-Manville (where a thicker

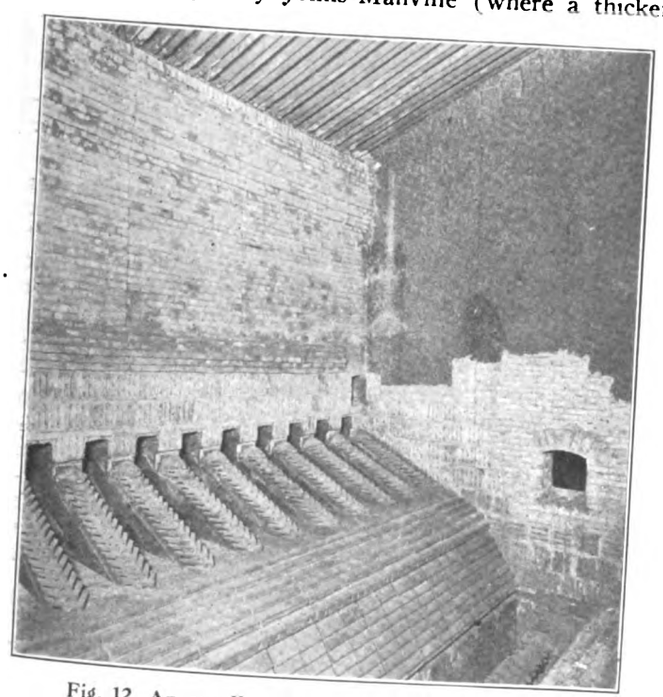
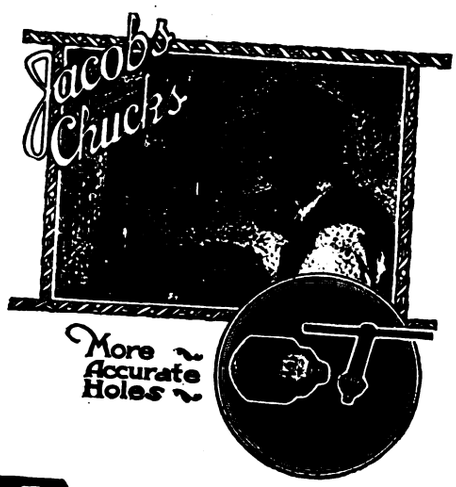


Fig. 12. An excellent bit of modern central station furnace wall construction. Notice the ventilated blocks adjacent to the fire-bed. Furnace has been shut down to make minor repairs to the side wall linings.



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WHERE sensitive drilling is required, there is absolute need of balance and accuracy at high speeds.

Almost without exception sensitive drill manufacturers have adopted Jacobs chucks as standard equipment, and have designed their drills with spindles fitting directly into the taper hole of the chuck to insure the use of correct models. Thus the use of Jacobs Chucks is assured and a guarantee on the drills can be given.

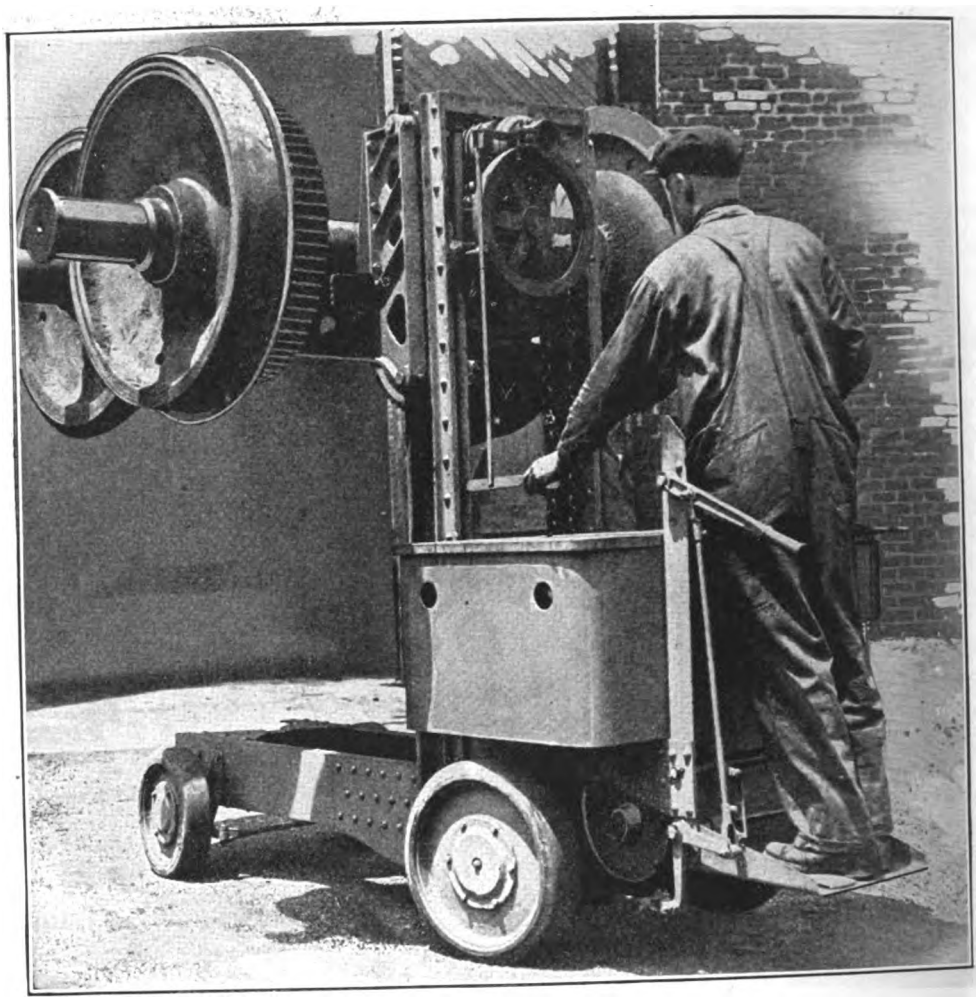
A Jacobs Chuck on a sensitive drill saves its cost almost daily in

Better Holes
Fewer Broken Parts
Greater Production

JACOBS MANUFACTURING CO.
HARTFORD, CONN.

The World's Largest Producers of "Drill Chucks"

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MORE and more plant managers are reading cheerful news in records of material-handling costs. Their materials and work-in-process are hauled from operation to operation on capable electric industrial trucks and tractors.

For these far-sighted men there is a most important message below. Many of them have already found it out. But read it. It may shave dollars off your handling costs.

In the battery box of your electric industrial truck

lies a chance to save some money

WHEN you put electric industrial trucks and tractors on the job in your plant you trimmed the cost of handling materials and work-in-process. Now, even the cost of operating electrics can be hammered down another notch. There are many plant managers who can tell you how to do this.

These plant managers are the men who studied the essential traits of the truck's source of power. They found that the cost of material handling is governed largely by the cost of operating storage batteries. They added to the cost of the battery, the cost of repairs and recharging—then they divided the total cost by the number of months the battery stayed on the job.

It is significant that many of these far-sighted men now power all their material-handling trucks with Exide-Ironclad Batteries.

Why? Because—(1) The first cost of the Exide-Ironclad Battery is reasonable. (2) It is rugged; the repair bench seldom sees it. (3) It is inexpensive to charge with current because of its unusually low internal resistance and high watt-hour efficiency. (4) It stays on the job month after month, for years.

But low cost of operation is not all that recommends the Exide-Ironclad Battery. It is a mighty reservoir of power. In easy, level going it delivers ample current economically. With any sudden need for extra power comes a surging flood of energy that will take a truck almost anywhere.

This battery provides all the speed you need, for the *first* run in the morning, for the *last* run in the afternoon. It is worth your while to get the whole close-up story—all the facts on why so many plant men standardize on Exide-Ironclad Batteries. A post card brings to you the interesting booklet, Form 1874, "Facts for Consideration in *Selecting a Battery* for Electric Industrial Truck and Tractor Service."

Send for it today.

It may shave dollars off your handling costs.

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

In Canada, Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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joint with greater bonding power is used, with the excess mortar squeezed out of the joint flattened to a thin cone covering the entire joint plus a small area of the exposed face of each adjoining brick) is another solution; and the monolithic refractory furnace lining is still another.

"Circumstances alter cases," said the sage of old, and this is always true of furnace problems. No one method or selection of refractories is a panacea for all furnace wall troubles. In each case particular conditions must be studied.

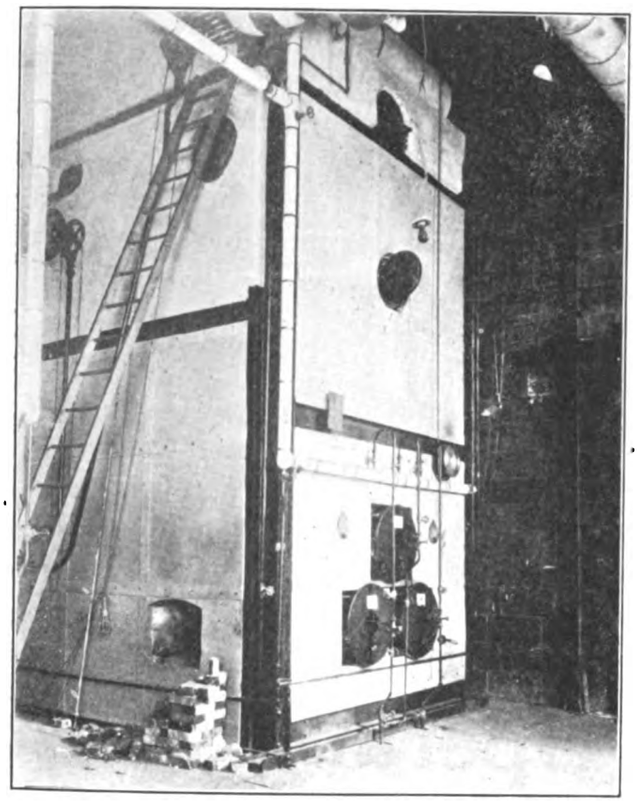


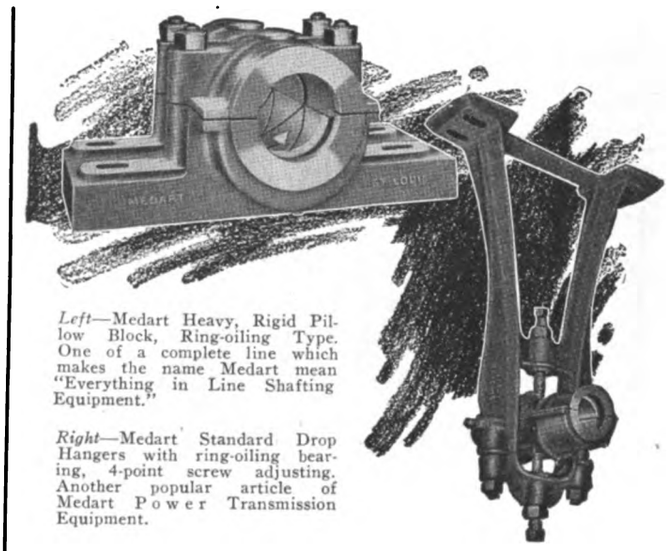
Fig. 11. A fine example of a well-insulated oil-fired furnace. Insulation on the furnace exterior is a major factor in reducing the losses due to the inflow of excess air, and helps prolong the life of the interior refractories.

In the thin, exposed refractory brick joint the bond is not always good, the mortar shrinks in burning, leaving the sharp edges of the brick exposed and subject to spalling. In the T or covered joint the greater amount of mortar makes a better bond, but is subject to greater shrinkage strains. And the monolithic lining must be applied to the walls in such a way as to secure a perfect bond with the walls, else gas pockets will form between the lining and the wall which will eventually break down the lining, the wall, or both.

Yet some particular combination of refractory and method of application will best serve any particular condition, to the end of cutting maintenance costs to the bone. And the benefits to be derived by the power plant engineer and the industrial executive from a serious study of this subject are two-fold:

1. The longer the life of your furnace walls, the lower will be your power costs and the costs of your manufactured product.

2. The more resistant to the destructive effects of high temperatures you can make your furnace walls, the better will they stand up under the higher operating ratios of today and tomorrow.



Left—Medart Heavy, Rigid Pillow Block, Ring-oiling Type. One of a complete line which makes the name Medart mean "Everything in Line Shafting Equipment."

Right—Medart Standard Drop Hangers with ring-oiling bearing, 4-point screw adjusting. Another popular article of Medart Power Transmission Equipment.

MEDART

Bearings and Hangers

Medart Bearings and Hangers are substantial—sturdily built to safely carry more than the loads usually imposed upon them. They are sufficiently heavy to maintain proper rigidity under operating vibration and can be easily and quickly erected, adjusted and aligned.

Pillow Blocks and Bearings

Pillow Blocks and Bearings are made by Medart in a wide variety of types for general line shafting requirements—heavy rigid ring-oiling types (with or without adjusting base plates)—wick-oiling and plain oiling types—common flat boxes—solid journal boxes—ball and socket pillow blocks and open adjustable types. They can be supplied in any required size, and are lined with virgin bearing metal best adapted to speeds and pressures generally encountered.

Standard Drop Hangers

Standard Medart Drop Hangers form a rigid "road bed" for line shafting in general service. Medart Hanger Frames are specially proportioned for strength and are fitted with 4-way adjustment screws with jam nuts for maintaining proper alignment of their bearings. They are equipped with Medart hanger bearings, either ring, collar or wick-oiling type. We are also prepared to furnish Universal Drop Hangers, Single Brace Hangers, Sling Hangers, Extension Hangers and Closed Post Hangers.

Everything in Line Shafting Equipment

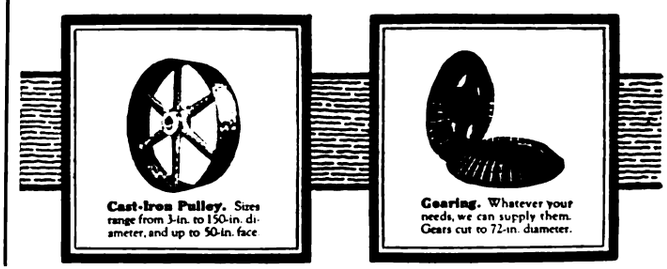
Besides Hangers, Bearings and Pillow Blocks, Medart makes a complete line of Power Transmission Equipment. Concentrate your purchases and fill all your transmission requirements through Medart Catalog 43, with discount sheet. This affords a simple, direct method of economical buying. Engineer's estimate furnished on your specifications without obligation.

THE MEDART COMPANY

(Formerly Medart Patent Pulley Co.)

General Offices and Works, St. Louis, U.S.A.

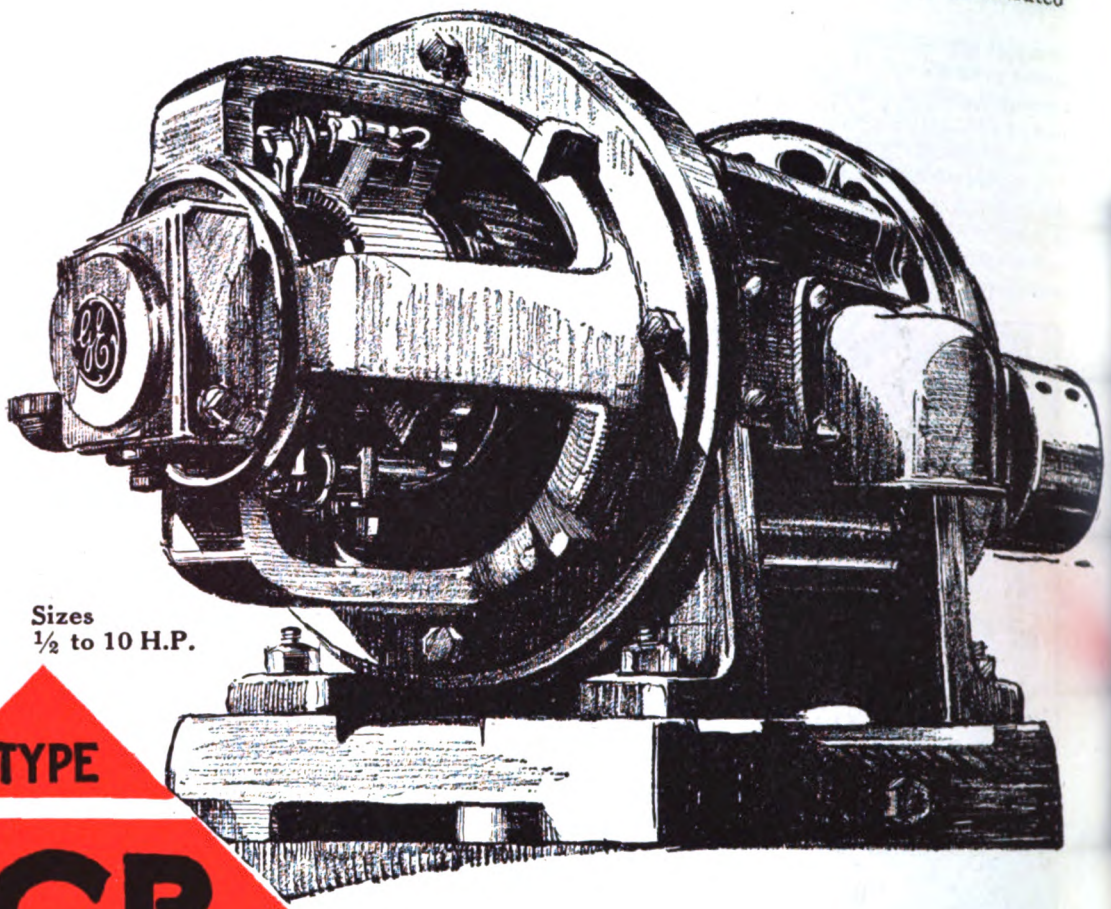
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Cast-Iron Pulley. Sizes range from 3-in. to 150-in. diameter, and up to 50-in. face.

Gearing. Whatever your needs, we can supply them. Gears cut to 72-in. diameter.

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Characteristics:

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—Start
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—"Pull Out"

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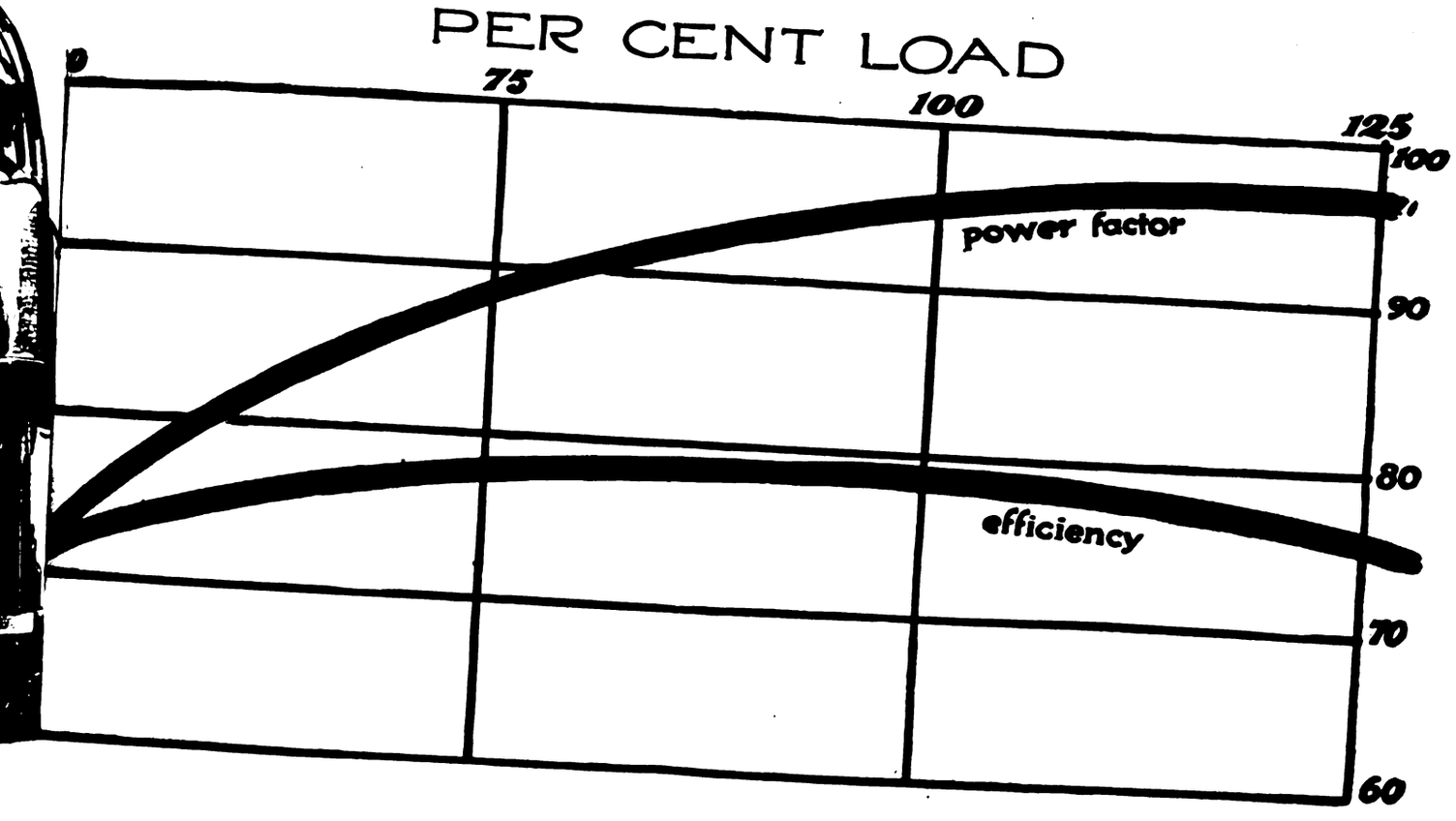
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The power factor of SCR motors is unusually high (approaching 100%) throughout the working range!

The efficiency of the SCR motors as a line—as well as the efficiency of each size throughout the working range is high!

Wherever G-E Motors are installed, marked efficiency and economy are gained *and maintained* in the performance of machines they drive. Their balanced mechanical and electrical construction makes them exceptionally trouble-free and unfailing. G-E Motorized Power pays you as surely as good investment bonds. Ask your nearest G-E office for information as to your requirements.

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Poor lighting increases manufacturing costs—

Good lighting lowers them

Good lighting is as essential to low cost production as up-to-date machines and skilled workers.

Only 75% of all working time is spent under daylight: 25%, under artificial lighting.

Yet four of every five plants are poorly lighted. Is your plant one of these four?

Good artificial lighting in your plant will give a 15% increase in production or its equivalent in lowered manufacturing costs.

To learn if your plant is properly lighted, get in touch with your local electric service company, electric league or club. Without any obligation to you, they will study your lighting needs and recommend improvements that will effect economies in your plant.

Remember: even 200 watt lamps in proper reflectors on ten foot centers give less than 1% of daylight.

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WILLIAM STANIAR. He is in charge of operating, belting and transmission machinery of the E. I. du Pont de Nemours & Company. He has studied and investigated approximately 55,000 belting and transmission installations during the past few years. It is his job to keep the du Pont Companies' transmission costs down to a minimum. It is also his problem to increase production based on belting and transmission and to lower the maintenance cost of this equipment.

Mr. Staniar has accomplished these purposes largely through his belting and transmission standardization system which is in operation in all of the large plants of the du Pont Company and in two of the largest of the General Motors Corporation.

Based on the experience and knowledge derived from these industrial operations, it is Mr. Staniar's purpose to place before our readers in a definite way how it is possible for the right belting and transmission installation to increase profits. His article, beginning on page 12 of this issue, is the opening gun toward this end. In addition to covering the subject of belt drives, Mr. Staniar's series will also cover the selection and correct application of the various mechanical transmission methods now in use, such as the long line, unit line, direct motor connection, chain and reduction gear units.

We consider this series the most constructive and helpful on the subject of mechanical power transmission that has ever been published.—The Editors.

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"Mr.

JONES, there's a paint job that's going to give our company years of *real* service — and save us money, too.

"The entire plant, from top to bottom — smokestacks, roofs, walls, window and door frames, foundations; even the tanks, derricks, structural steel, fencing, etc., has been painted. And, I'm telling you, painted with the very best preservative paint years of practical paint experience has taught me to use.

"It is a difficult matter now, Mr. Jones, to get a paint that will give honest service—a paint that will do all that's claimed for it. But I've found **Valdura Asphalt Paint** will give the utmost in preservative service. It's not only absolutely waterproof, but in addition, acid and alkali resisting.

"It's the highest type of all-purpose paint I've ever encountered. It's made from the finest and purest materials that can be had — 99.5% pure Gilsonite *Natural* Asphalt forms its base. You will note we have used other colors than Black. **Valdura** is the only *real* asphalt paint that is made in colors other than Black. Because of its great durability, ease of application, large covering capacity, moderate cost and true preservative qualities, **Valdura** is a great aid in cutting down plant maintenance costs.

"Not only do we use **Valdura,** but such particular and exacting paint buyers as Allis-Chalmers, Bethlehem Steel, General Electric, New York Central, Swift, and many, many others use **Valdura,** and have been using it for years.

"I'm sure you, too, will find it just as satisfactory to use, and know the manufacturers will be glad to send one of their paint engineers to demonstrate this remarkable preservative paint to you.

"A card or letter will bring interesting data without obligating you in the least."



AMERICAN ASPHALT PAINT CO.

844 Rush Street Chicago

FACTORIES: LINCOLN, N. J.

Distributing points all over the United States and Canada

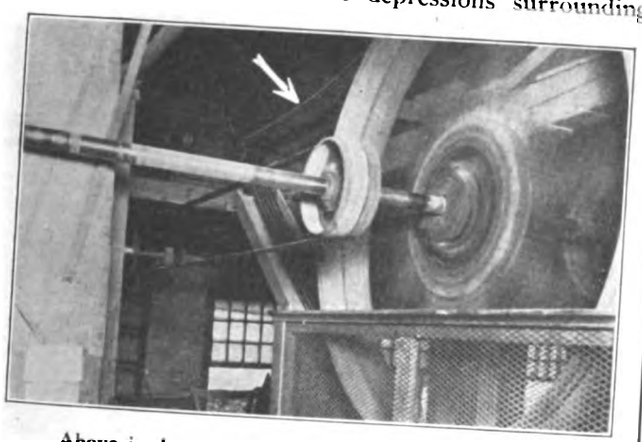
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New Suction Belt Enables Short Center Drive

By J. L. de Rabot

"TENTACULAR" Patent Belting, the suction belt, was put on the American market in August, 1924, by Alexander Brothers of Philadelphia. It originated in France in 1920 under the trade name of "Pieuvre," then was placed on the British market, where it is known today as "Adhex," also "Pulpo" in Spanish speaking countries.

This belt consists of an oak tanned leather backing, to the under surface of which are attached narrow longitudinal strips of a special kind of chrome leather treated with tallow. These strips are held in position by means of hollow brass rivets. The depressions surrounding



Above is shown a "Tentacular" Suction Belt running from a 7¼ inch motor pulley to a 90 inch driven pulley between nine foot centers. No idler pulley is required. The drive is 7 hp.

the rivet ends, combined with the blind holes in the rivets, act as suckers during use and further increase the very high adhesion of the strips.

From the technical standpoint numerous tests made on the belt show a co-efficient of friction of about 1.50. This high co-efficient of friction permits a correspondingly low tension of the belt. The increase in efficiency is very large if we consider the following figures:

A single ply leather belt 3/16" thick has a safe working capacity of 80 lbs. per inch of width. We shall take a 10" belt as example with, therefore, a safe working capacity of 800 lbs. The speed of the belt will be 3,000 feet per minute and the arc of contact of the belt on the pulley 180°. If we take a co-efficient of friction of 0.29, the average for an oak tanned leather belt, and 1.25, the minimum for the new "Tentacular" belt, the tension will be in the order of 380 lbs. for the ordinary belt and 75 lbs. for "Tentacular." The difference between the tension and the working capacity of the belt will give us the load available expressed in lbs. or the actual horsepower that the belt will be able to transmit from the one pulley to the other. Therefore, we shall have:

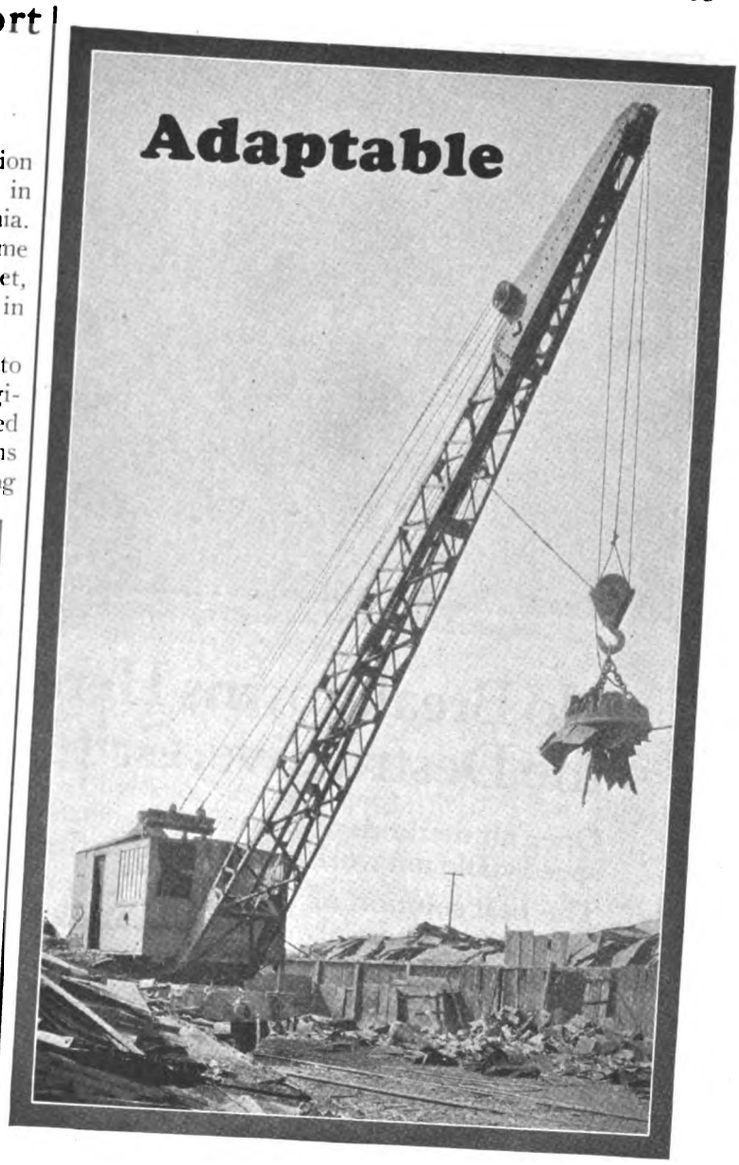
800—380=420 lbs.

$\frac{420 \times 3000}{33000} = 38$ hp. for the ordinary belt

800—75=725 lbs.

$\frac{725 \times 3000}{33000} = 66$ hp. for the "Tentacular" belt.

Remark: The co-efficient of friction of 1.25 is the figure adopted in the formulas to determine the horsepower capacity of a certain "Tentacular" belt.



For all Kinds of Work

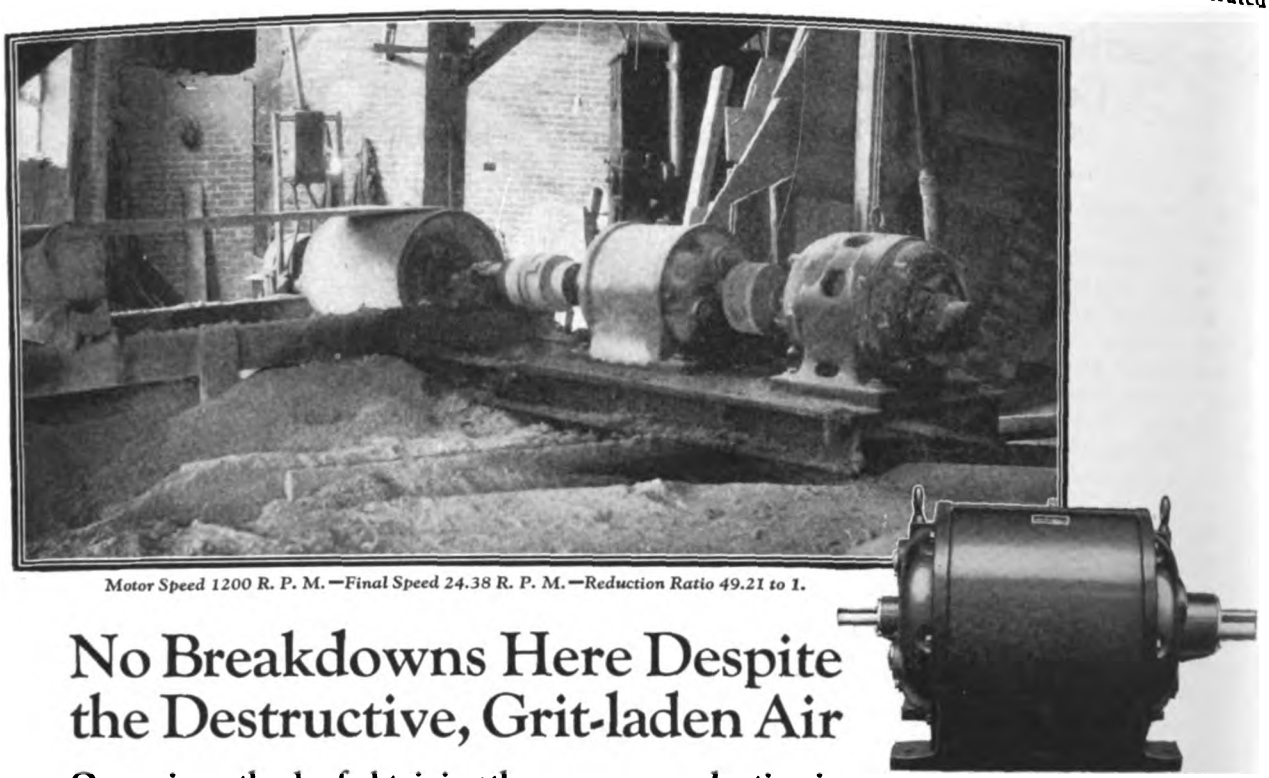
McMyler-Interstate locomotive cranes are widely used in industrial plants because of their adaptability to many different kinds of service. For handling iron and steel with an electro magnet, for unloading and reclaiming coal, for handling bulky waste products and for many other duties, these cranes are proving economical and dependable. Sizes range from 10 to 50 tons. May we tell you more about them?

Car Dumpers • Coal Handling Machinery • Clam-shell Buckets

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Motor Speed 1200 R. P. M.—Final Speed 24.38 R. P. M.—Reduction Ratio 49.21 to 1.

No Breakdowns Here Despite the Destructive, Grit-laden Air

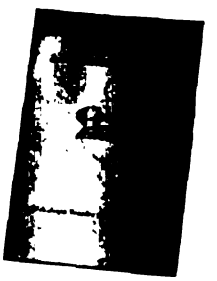
Open air methods of obtaining the necessary reduction in speed could not work satisfactorily in this sand lime plant.

The best solution of their problem was the Jones Spur Gear Speed Reducer. The gears, enclosed in a dust-proof, air-tight housing, work smoothly, quietly, positively—in a constant oil bath.

No attention is required except to fill the oil chamber once in a while. A balanced, straight line drive is obtained from the electric motor to the sand lime conveyor.

Note, too, the simple, compact arrangement—the evident ease and quickness of installation. From the initial cost on through their many years of efficient, trouble-free service you will find in Jones Speed Reducers many operating economies.

Perhaps in your plant there are conditions that can best be met with the enclosed reducer drive. Our speed reducer book, Number 26, will give you some pertinent information without cost. Write for it.



Send for Catalog No. 26

IT is a clear, unbiased exposition of present day speed reduction practices. Endorsed by leading engineers and technical schools. Fifty-six installation views alone of the more than 140 illustrations. Useful tables and formulae on speed reduction.

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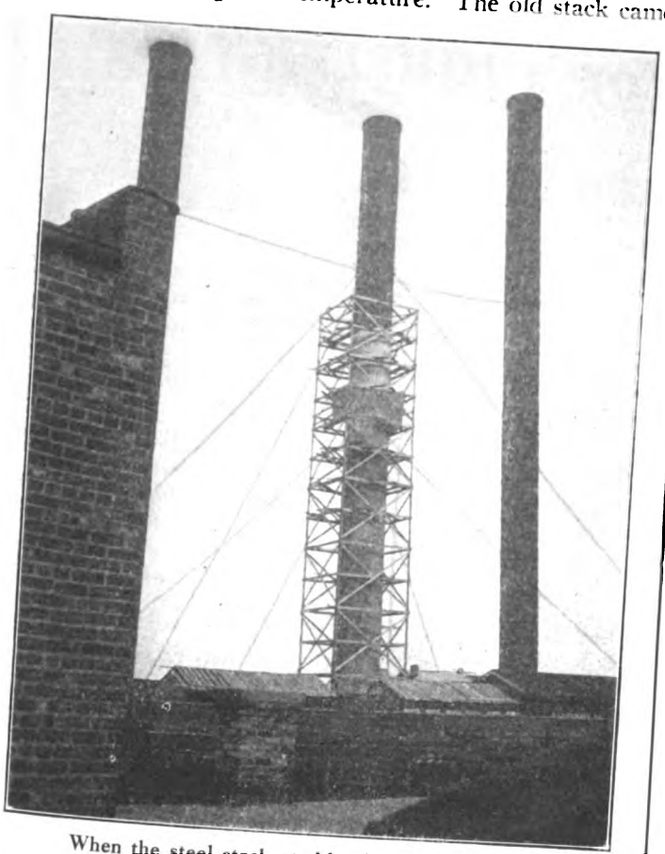
Concrete Stack Over Steel Stack

By George F. Paul

SPECIAL planning was required to save a steel stack 180 feet high. This stack, the middle one of three stacks at Power Station No. 1, of the Public Service Company, Waukegan, Illinois, had shown signs of weakness due to corrosion some years ago. The proposal to take it down and replace it was rejected as being too expensive in the first place and making it necessary in the second place to shut down one-third of the plant.

The decision was reached to save the stack by building another stack around it. One provision in the contract stipulated that there should be no interruption whatever in the regular service of the stack while the work was under way. To anchor the new stack to the old foundation, the existing foundation bolts were extended through the use of sleeve nuts and 1½ inch rods. In addition, a wire mesh fabric was used to help distribute the stresses and carry the green Gun-crete.

Around the hot steel stack was wrapped a layer of asbestos board. This served to keep the contraction and expansion stresses from being communicated directly to the new stack whose material was not so readily affected by changes in temperature. The old stack came in handy as a form to shoot against in shooting the Gun-crete in place. An 8-inch layer was applied at the bottom, tapering to 4½ inches at the top. For this mixture 3½ parts of No. 2 torpedo sand and one part of Portland cement were used, shot into place at a pressure of 50 pounds per square inch. A 60 hp. motor drove the 14 x 12 single stage compressor used for this purpose. The work was done under the direction of the Cement-Gun Construction Co. of Chicago.



When the steel stack at this plant began to corrode the concrete reinforcement was cast around it using the steel stack as a central core.

THE LENIX DRIVE

(TRADEMARK REG.)



90 Lenixes assembled for shipment to **one company** on **one order** are shown in the photograph. That purchaser is now using 223 Lenix short center belt drives on installations ranging from 5 to 150 horse-power.

A number of machinery manufacturers and suppliers have adopted the Lenix short center drive as a standard for their equipment.

The Lenix is not an idler. It is a "belt wrapper" scientifically applied to belt drives for the purpose of eliminating belt slippage, saving floor space and increasing the general capacity of the drive.

Booklet, "Saving Slippage and Space," contains the facts that have induced the installation of thousands of Lenixes, in practically every industry of the country, on drives ranging from 1 to 1,400 horse-power.

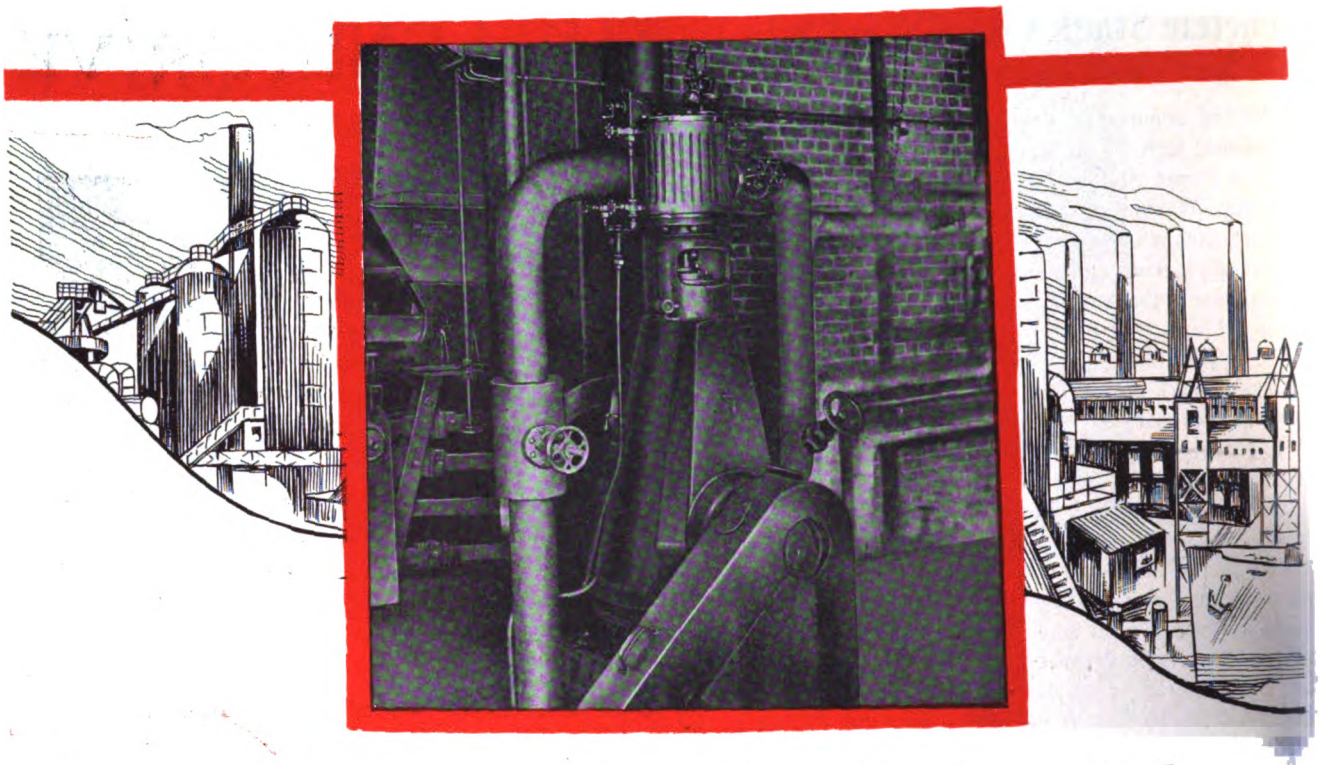
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F. L. SMIDTH & CO.

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Steam Power Costs for Industrial Purposes Lowered with Troy Engines

Also Used for Driving

FANS
STOKERS
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GENERATORS

Wherever steam is required for process work, Troy Engines have been found to be ideal units for driving generators and auxiliaries, because of the minimum expense necessary for maintenance and lubrication and because of their exceptional sturdiness in construction.

For heating, cooking, sterilizing, slashing, drying and other purposes, therefore, the exhaust steam is being very profitably utilized.

Here again the 33 years of specialization in the one thing, that of building the best engine possible at the lowest cost, without lowering the quality, is very evident on the many Troy installations. The location of the Troy Plant, where low freight rates are assured for both raw and finished products, the pleasant working conditions and the economical production methods planned and executed, have all helped to build an expensive type of engine that sells at a reasonable price.

Troy Engines have the self-compensating, steam tight valve which automatically clears the cylinder of any condensation. They are oil and dust proof—entirely enclosed. Bearings are always assured of a continuous supply of oil through the Troy Automatic lubricating system.

Built in sizes up to 200BHP both in horizontal and vertical types.

Write for Troy Catalog.

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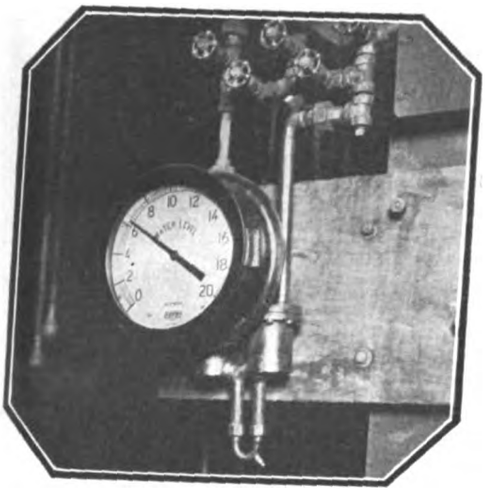
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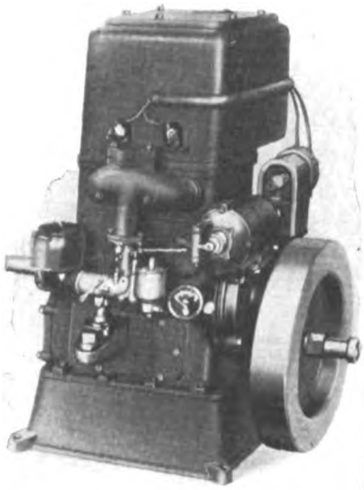
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New Appliances for Heat and Power Economy

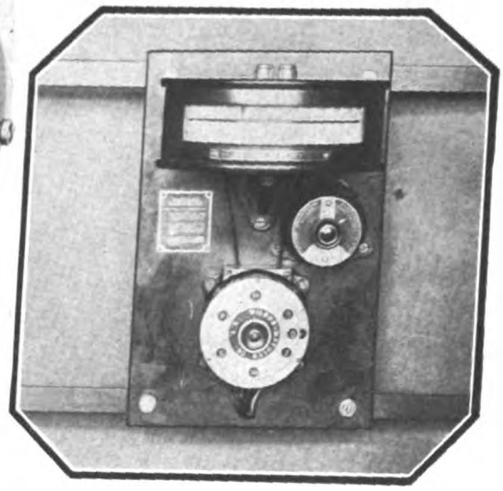
Below is the new Foxboro Recording Boiler Level Gage which indicates supply fluctuations, surgings, etc. It is an effective check on boiler feeding.



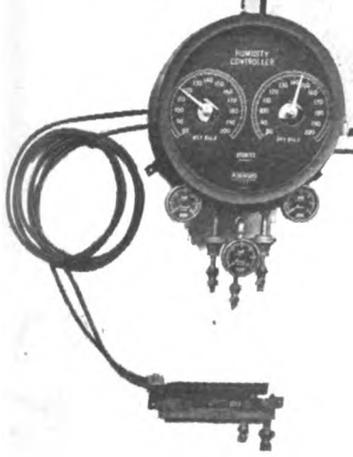


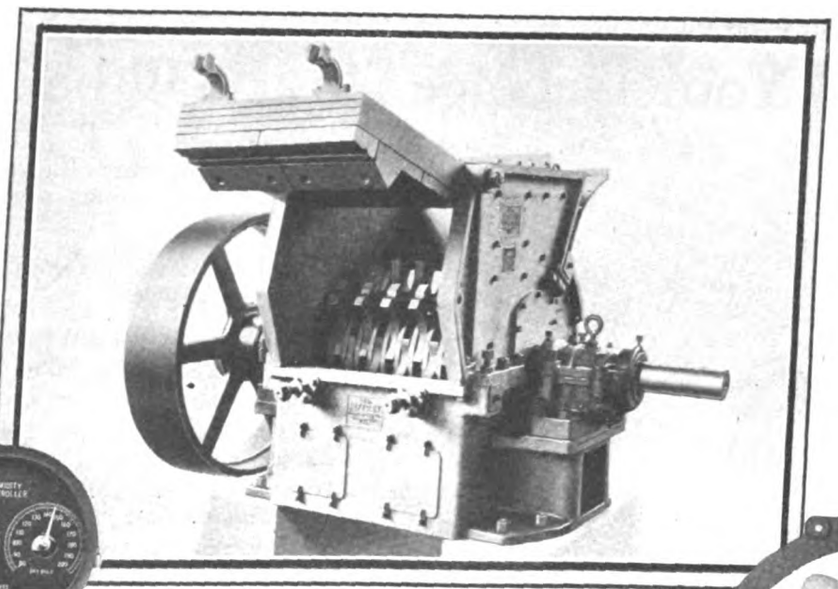
Above is a new two-cylinder model "AB" Gasoline Engine especially designed for the industrial field and developing from five to nine horsepower, according to speed. It is made by the Fuller and **Johnson Mfg. Co., at Madison, Wis.**

The instrument below indicates, records and controls temperatures below 900 degrees F. It is a new product of the Wilson-Maeulen Co., 383 Concord Ave., New York.



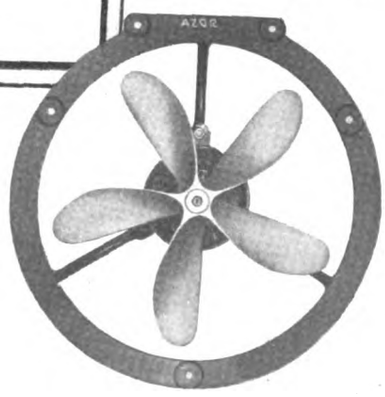
The non-recording Humidity Controller shown below is a new product of The Foxboro Co., of Foxboro, Mass. It is intended chiefly for processes in which an instrument receives rough treatment.





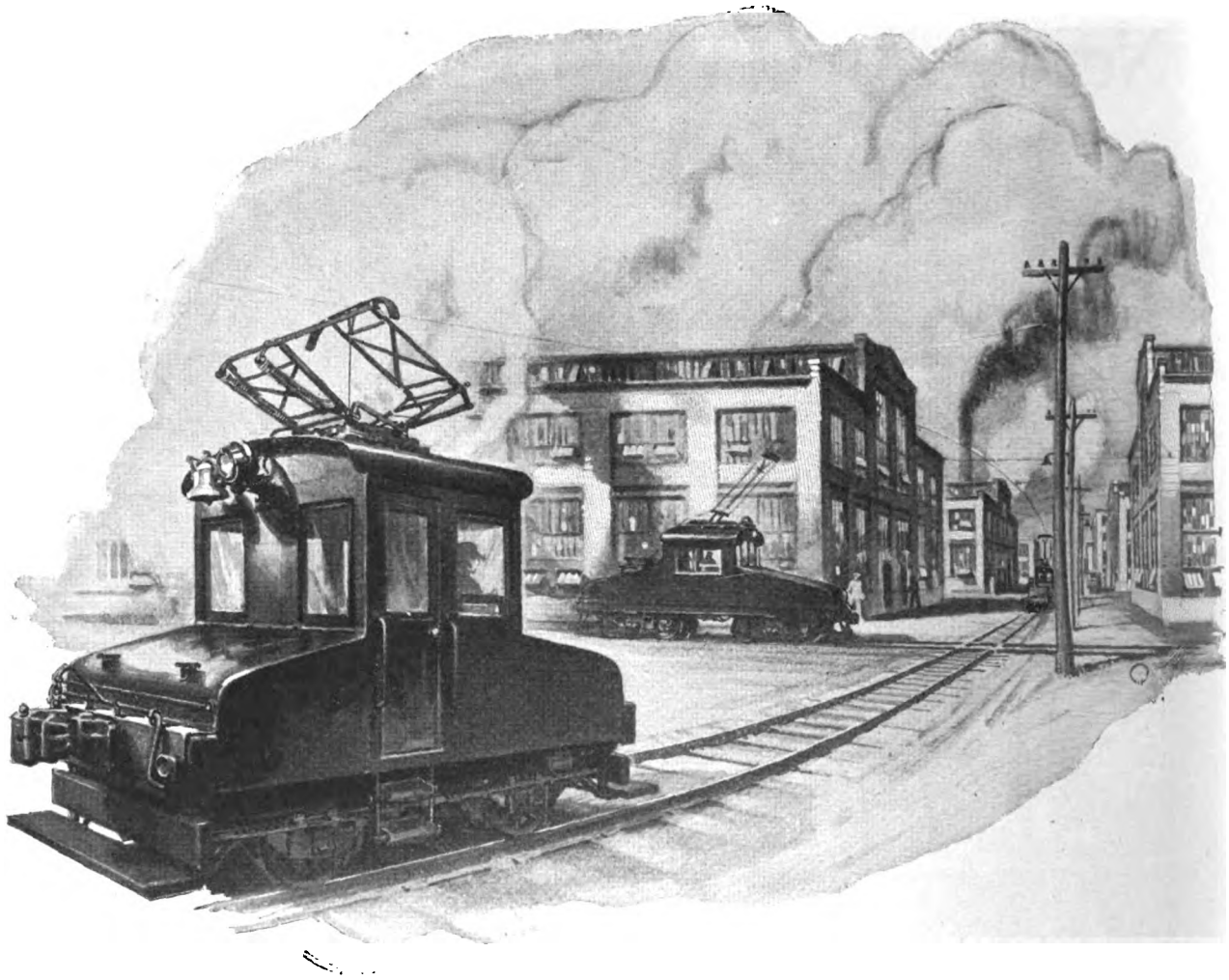
Above is a new Rigid Hammer Crusher designed especially to reduce run of mine coal to uniform product in one operation. Special attention has been paid to reducing the amount of fines. It is built by the Jeffrey Mfg. Co., of Columbus, Ohio.

The airplane propeller principle has been applied to electric ventilation in the unit shown below. It is called the Azor Super-Fan and is a product of the Azor Motor Mfg. Co., Bessemer Ave., Cleveland, Ohio.



(Continued on page 69)

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Put G-E Locomotives on the Track Your Haulage Costs will be Lower

Industrial haulage is generally short and spasmodic. Spotting freight cars, carting away refuse and conveying material from building to building are the principal forms of service.

For this class of work G-E Electric Locomotives provide lower cost-service because they—

1. consume power only when operating
2. are ready to go without delay
3. have large momentary overload capacity
4. are easy to control by one man of ordinary intelligence
5. have few wearing parts, consequently low maintenance cost
6. are free from fire, smoke and noise

G-E Electric Locomotives are built for heavy or light service in all types—storage battery, third rail, trolley, or combination trolley and storage battery types and for narrow or standard gauge tracks.

The electric haulage idea is being successfully applied in all classes of industries. Let G-E engineers study your problem; their recommendations will not obligate you.

14-7

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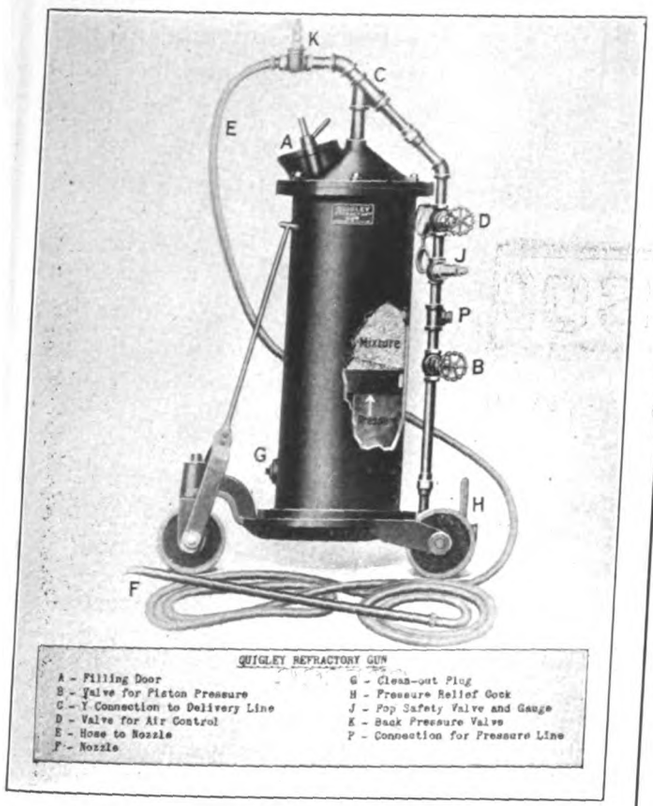
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New Appliances for Heat and Power Economy

(*Continued from page 67*)

Nearly every step forward in industry and engineering is marked by the production of new apparatus or equipment. This is no more nor less than one should expect for equipment, in other words, machinery of all kinds are the tools of industry. When a new purpose is found a new tool is soon made to serve it.

It is for this reason that live factory managers, superintendents, and other industrial executives should keep themselves posted regarding the current developments in new equipment. One can never tell when the need will arise even though it may not exist at the moment, and it is a very convenient thing to be able to go back to your file of past numbers of INDUSTRY ILLUSTRATED and



Relining, patching or surfacing furnace walls is accomplished with great speed and at low cost by the use of the Refractory Gun shown above. This is a product of the Quigley Furnace Specialties Co., of 26 Cortlandt St., New York.

find there the reference to the needed equipment that you remember having seen.

It is for this reason that INDUSTRY ILLUSTRATED presents each month in attractive and brief pictorial form these snapshots of new equipment. We are kept informed of their coming developments by several thousand makers of such equipment, who thus coöperate with us in rendering a service of information to our readers.

If any of the readers of INDUSTRY ILLUSTRATED should care to have a more detailed description of any of the items that we thus show from month to month, they need simply address a letter or post card to the editor who will see that complete information is sent.

Progress is Relative-But,

a second story on a log cabin was progress, once. Today, even a Mussolini casually orders plans for an 80-story Civic Temple. A better way of patching Caesar's chariot was an achievement in its time. Now the drilling of a locomotive frame in solid steel is nothing.

Once a drill wore itself away in drilling a single hole. Now CLE-FORGE goes through cast iron at the rate of 116 inches and through machinery steel at the rate of 50 inches per minute.

What you need in drilling ability is here, today; superlative penetration if your work requires it; superlative service on any work; and drills that we will back this year or next on any job you put them to.

As always, CLE-FORGE HIGH SPEED DRILLS "tell their own story" best. They are carried in regular stock by Cleveland Dealers everywhere.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON

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AMERICAN INDUSTRIES
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By Using

We do not claim any remarkable discovery in our product, but we do claim that the combination of the different ingredients in the right proportions, as used in CRESOG have reduced hospitalization in Industries fifty per cent and reduced the possibilities of infection ninety per cent.

CRESOG is a soluble solution and is ready for instant use, and is not diluted. CRESOG is a safe first-aid product and a necessity in every factory, and requires no special training in its use.

No additional healing agent is necessary.



CRESOG is used in the clinic of the largest Casualty Insurance Company in the City of Detroit and has been consistently used by their assureds for over twelve months, with excellent results.

CRESOG does not burn or destroy tissue, or discolor the skin like Iodine, and the dressings stay moist 12 to 24 hours.

CRESOG will more than pay for itself in the time saved in dressing wounds.

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Place Your First-Aid Department on a Business Basis

CRESOG IS FURNISHED IN 4 OZ. AND GALLONS

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Enclosed find $1.00 or P. O. for four ounce trial size of CRESOG. If not satisfactory after 60 days' trial you are to refund purchase price.

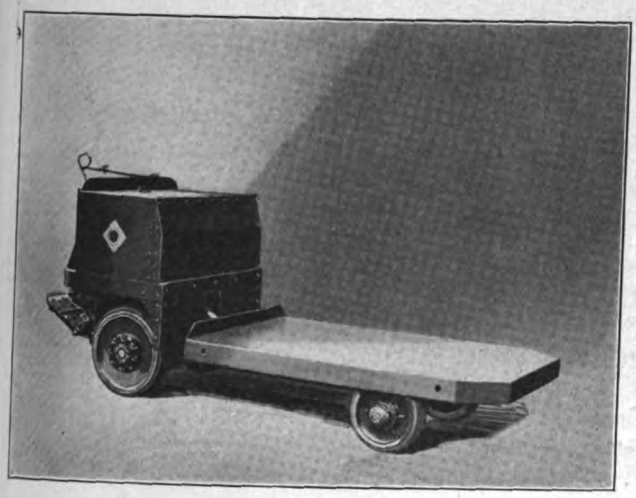
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New Type Electric Lift Tructor

THE Elwell-Parker Electric Co., Cleveland, has developed a heavier unit of the electric lift type especially suited to travel runways not altogether smooth. This haulage unit is of broader gauge than those designed particularly for inside operation. The gauge of front and rear wheels is the same, i. e. 30 inches. They are fitted with 22-inch drive and 15-inch front wheels and with either 3½ or 4½ inch tread. Drive wheels are fitted with double row ball bearings weighing 13 pounds each, and radial and thrust bearings measuring seven inch in outside diameter.

An innovation in tructor design is found in the all-drop forged differential. The differential carries a special Brown & Sharpe phosphor bronze worm wheel, lock bolted between the two halves of the drop forged differential cage. A multi-thread Brown & Sharpe steel worm on radial and thrust bearings with the above parts of differential, are assembled and adjusted at the bench and the whole dropped into the axle differential pot. A new type of universal joint inside brake wheel connects drive



worm to motor shaft with demountable armature. Motor is fitted with ball bearings.

Another feature found in this type is the flexibility of the drive unit when traveling over rough surfaces or when platform is loaded unevenly. The tructor platform measures 40 in. in width by 72 in. in length and is formed from a single steel plate with deep side flanges. The platform nose is tapered to aid its insertion beneath a skid even though approached from an angle.

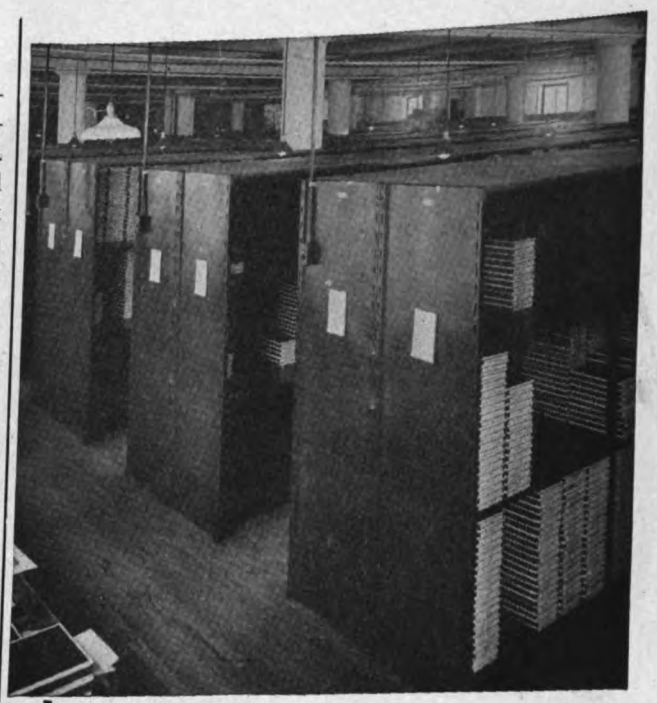
The lift of this platform is 6½ inches. It is 17 inches high when in lowest position and 23½ inches when raised.

Clearances are important when tructor crosses door sills, passes over the crest of an incline or a wheel drops into a runway depression. The frame on this new type is of the standard commercial angles and channel heavy section type, hot riveted throughout and offers possibilities for varying platform lengths.

The low set, all-steel battery compartment at one end is fitted with removable end doors and hinged cover to facilitate inspection or quick exchange of Exide or Edison storage batteries.

The wiring is unusual in that the leads between controller and battery are continuous—no splices—to motor brush studs and motor field coils.

The controller is of an entirely new design with reverse drum.



Making "The Needle in the Haystack" Easy to Find

FINDING, with old fashioned storage methods, is too often like "hunting for the needle in the haystack." Articles get into out-of-the-way corners and are completely lost until someone accidentally happens upon them.

A Durand Storage-Finding System eliminates the high cost of such "Needle in the haystack" storing.

Durand Steel Racks, Bins and Shelving are built on the unit principle of standardized sections. They lend themselves to any desired arrangement and can grow with your business. They form the basis for a permanent storage-filing system that makes finding easy, accurate and fast.

With the Durand Storage-Finding System articles are labeled, definitely located and arranged in logical order. Wasted trips to the wrong bin are eliminated. Stocks are always ready for inspection and accounting. A perpetual inventory can be easily maintained to guard against shortages and surpluses.

Durand engineers have made storage space pay dividends, with such storage-finding systems, in varied lines of industry. They are always willing to recommend possible solutions of stock room problems, without obligation. Why not try them?

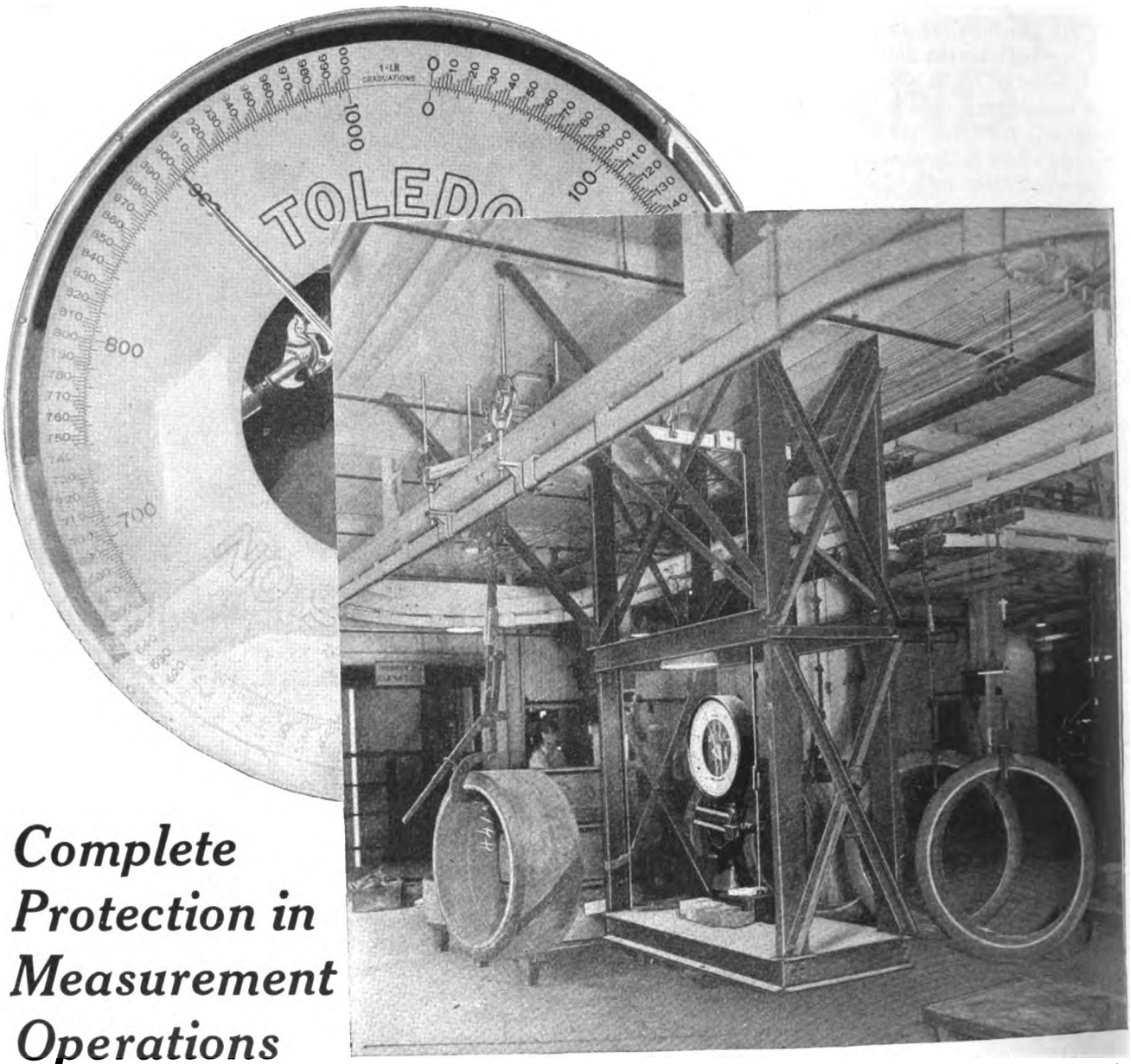
DURAND STEEL LOCKER COMPANY

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LOCKERS BINS **STEEL** SHELVING RACKS

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because the Toledo Scale Company through its numerous field offices provides a skilled and effectual service for scales never before equalled, and by agreement with the user renders such systematic, periodic inspection as insures continued accuracy in the measurement of materials—

and because every measurement operation however obscure is worthy of the best scale equipment obtainable—

thousands of scale users, both large and small, place with this company, not only an occasional order for a scale, but their ***entire scale business.***

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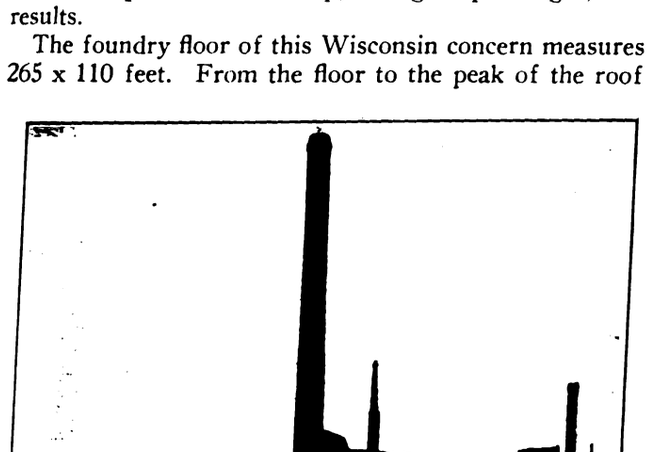
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Securing Ventilation in an Aluminum Foundry

By Hugh Coler

A WISCONSIN concern, manufacturing aluminum castings on a large scale, has solved the problem of efficient ventilation of its foundry through the erection of a 223-foot stack or chimney. The "pull" of this tall stack is sufficient to produce ideal working conditions in an industry where such a condition seldom is found. The difficulty centering in the casting of aluminum is due to the fact that because of the low pouring temperature of this metal and its greater contraction it is necessary to use a core sand mixture which will soften and burn at a temperature below that which is needed in working with either iron or steel. The core mixture must contain a goodly percentage of rosin and this, naturally enough, is a source of a great deal of smoke and gas. The usual methods of foundry ventilation will not handle so heavy a generation of smoke and gas. Not only is the health of workmen imperiled as a result but poor workmanship, owing to poor light, also results.

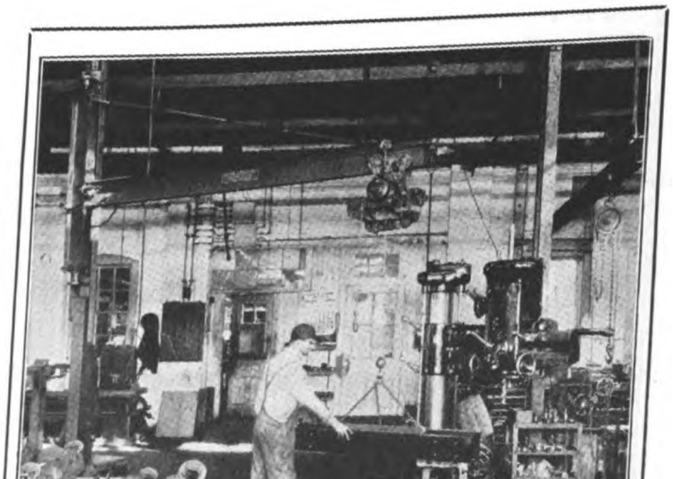
The foundry floor of this Wisconsin concern measures 265 x 110 feet. From the floor to the peak of the roof



The 223-foot stack, erected solely for the purpose of securing efficient ventilation.

is 59 feet. In order to secure uniformity of action the crown of this building has been tapped at both ends and the center by flues that converge toward the stack and which unite to form a larger flue that passes into the chimney at a point 54 feet above the ground. The small flues measure 5 x 4½ feet, while the larger flue, which passes into the chimney, is 12 feet high by 4½ feet wide.

It was necessary to install some method of control over the volume of air passing through these flues in order that too much heat might not be drawn out of the work room on winter days. At this season, of course, the efficiency of the stack is greatly increased owing to the greater difference in temperature between the flue gas and the outside air. Control has been gained through two methods of regulation. One of these consists of adjustable openings at the point where the flues enter the roof. The other is a damper installed in the larger section of the flue near where this enters the stack. It is wholly possible through these means to regulate the volume of air drawn off through the chimney. The tem-



LIGHTEN LABOR
WITH
ROEPER ELECTRIC HOISTS

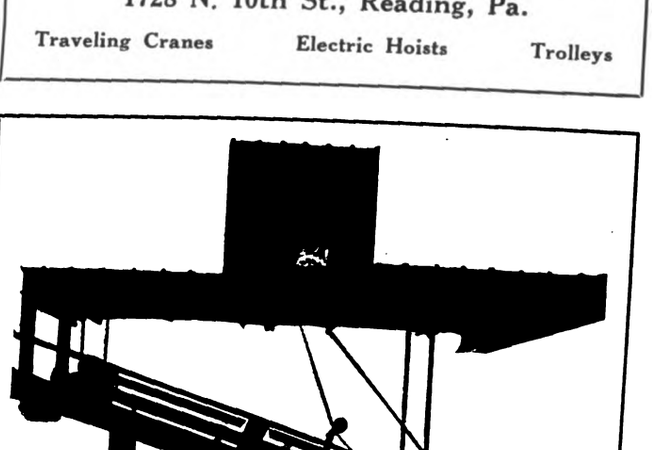
Keep the machines active so they produce the utmost.

The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

Ask for full information.

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1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys



Make Your Conveyors Move and Weigh—

Do two things at once; combine two operations, and thus save time and money. By doing so you will give yourself a fair break on the materials you receive and ship. Know how much is being moved.

The Merrick Weightometer attached to your conveyors will accurately record the weights of loose and bulk materials, as they move along. You need not depend on the bills of lading or "guess" weights.

Write for "Merrick Circulars" now; stop relying on uncertainties—know how much you're handling.

MERRICK SCALE MFG. CO.
180 AUTUMN AVENUE, PASSAIC, N. J.

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THOMPSON'S
HACK SAW BLADES

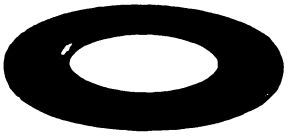


"MILFORD" Brand—All hard tungsten steel for cutting solids such as tool steel, rails, etc.



THE WAVY SET BLADE

"MIL FLEX" Brand—The Wavy set blade Soft-back tungsten steel practically unbreakable, for cutting pipe, BX, Sheets, Conduit, etc.



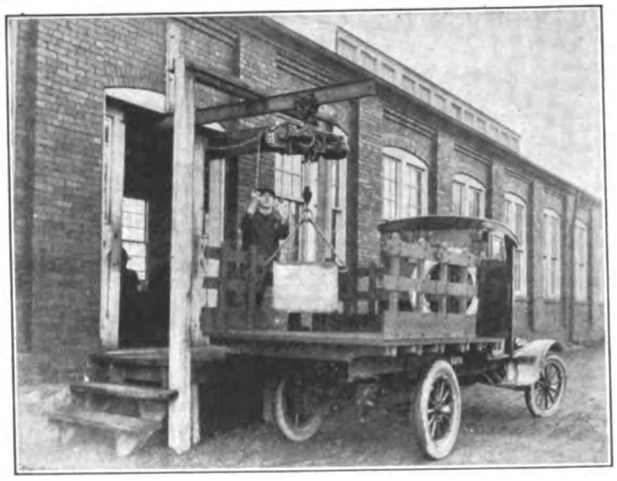
THOMPSON'S Flexible Back Band Saws for cutting Metals.

Sample band or hack saw blade sent on request.

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perature of the foundry room in winter is thus under control. In summer the dampers are left wide open. The more heat that gets away up the chimney at this season the better it is for the men toiling over the furnaces and pouring metal.

An arrangement essentially similar to that which has been described has been installed for handling the gases from the melting furnaces. These are oil burning and of the iron pot type. Sheet iron aprons arranged above the furnaces collect much of the hot gases and lead them into flues arranged in a fashion similar to those previously described. These flues, however, tap the



This close-up view shows the converging flues from the two ends of the building. These flues entering the stack at a point fifty-four feet above the ground.

chimney at a point near the base of the stack. Still other flues are provided to draw the fumes from the core ovens, the knock-out grates and so on.

The stack itself measures 12 feet in diameter at the base. It is built of radiol brick and is located opposite the center of the long axis of the foundry building. It is planned eventually to duplicate on the other side of the stack another foundry building similar to the one now in use. It is believed that the present stack is sufficiently powerful to handle the ventilation of this proposed structure in addition to its present service. It is interesting to note that the stack really solves three problems now very much to the foreground of industrial management: ventilation, heating and lighting.

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Policing your Boiler Water Levels



The Vigilant is the policeman of your boiler water levels—it absolutely insures the proper levels at all times. It is unfailing because its action is entirely automatic, having no floats, tubes or diaphragms — it cannot fail or get out of order.

Its installation is the signal for you to forget your boiler water levels. Regardless of pressures that may be applied at any time, the Vigilant automatically and promptly arranges the proper water level. Explosions are prevented—power economies secured.

You cannot afford to be without the Vigilant.

Our circulars will give you more information.

The Chaplin-Fulton Mfg. Co.
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Victor



Hack Saws

Try our

New Special Flexible Blade

We want you to try our new blade and use it on materials and under conditions that have been producing your greatest breakage.

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Tear out part of this advertisement and enclose it with your letterhead for sample blades.

VICTOR SAW WORKS, Inc.
Middletown, N. Y.

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DIRTY GLASS. (A 2 years' accumulation of grime). ½ of 1 foot-candle illumination. Even with 14 electric lamps, only 2 foot-candles (on a bright day). (This photo required an 18 minute exposure).



CLEAN GLASS. (The same glass cleaned with SKYBRYTE). No artificial light. 38 foot candle illumination—19 times more! (This photo required less than 1 second exposure).

The remarkable story in pictures of what SKYBRTE, the National Glass Cleaner, did for one foundry. You can do the same in *your* plant by simply signing the coupon below.

We will exhibit at
AMERICAN FOUNDRYMENS' CONVENTION
at Syracuse, N. Y., Oct. 5 to 9, 1925.

The SKYBRYTE Co., Keith Bldg., Cleveland
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CLEANER (LIQUID)

TRIAL OFFER COUPON

The SKYBRYTE Company, Keith Building, Cleveland, Ohio.

You may ship us ten gallons of Skybryte at the barrel price on trial, and one regular 75c Skybryte brush FREE. We will use enough to make a thorough trial—enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect, and you will cancel invoice. Otherwise we will pay your invoice for ten gallons Skybryte at $2.50 per gallon, F. O. B. Cleveland. Skybryte in bbls. $2.50 per gallon freight allowed.

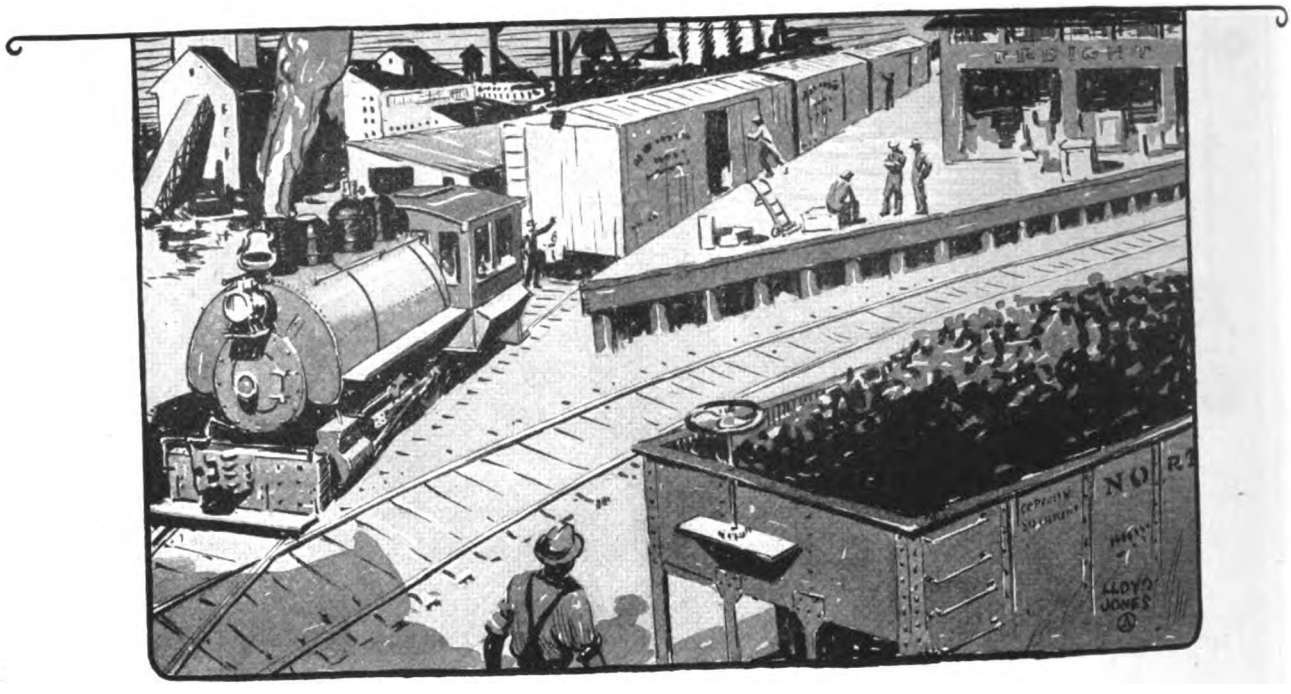
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When the Cars Are Loaded They Are Ready to Go



EFFICIENCY demands that when the cars are loaded or unloaded they be moved at once so that the smooth, profitable movement of materials is not interrupted at any point.

The usual delay in plants that rely on outside switching facilities, with its consequent labor loss and double handling of materials, add greatly to your manufacturing cost.

A privately-owned locomotive of exactly the right size to fit your needs will eliminate these delays. In many installations, the saving in switching charges alone shows a Davenport to be a revenue producer. Nor is the size of your plant alone the determining factor. Many factories, formerly thought to be too small to own a private locomotive, are now finding it a profitable investment.

For twenty-five years, we have studied industrial installations and have learned to fit the proper locomotive to the job it must perform.

Our engineers are ready to study your requirements, and their assistance infers no obligation.

Choosing the Locomotive for the Industrial Plant

Perhaps you are convinced that a locomotive would be profitable at your plant, but have hesitated because you are undecided whether to buy the steam or gasoline model.

The folder, "Choosing the Locomotive for the Industrial Plant," will gladly be sent on request and presents some interesting material on this subject for the consideration of industrial executives.

DAVENPORT LOCOMOTIVE WORKS
Designers and Builders of Steam and Gasoline Locomotives
2507 Rockingham Road · Davenport, Iowa

Davenport Locomotives

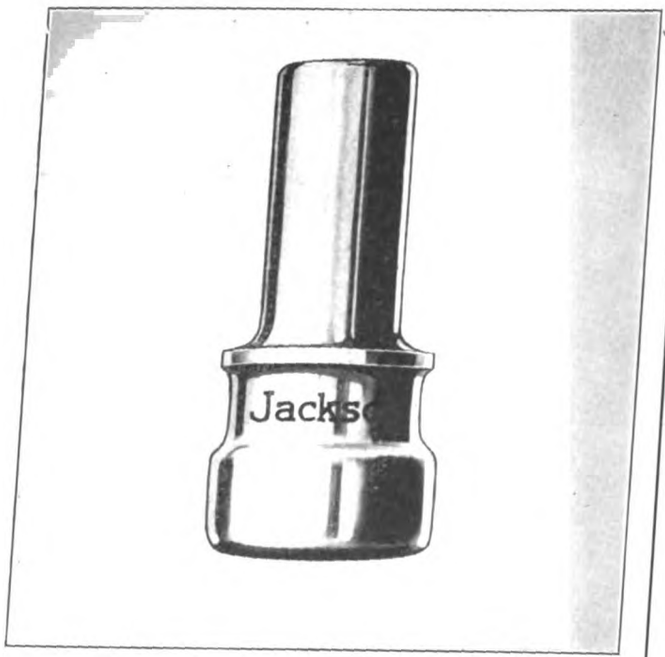
Dependable in every Industrial Service

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New Rivet Set

THE illustration shows a new rivet set, called the "Jackset," now being manufactured by the Ingersoll-Rand Company, 11 Broadway, N. Y. It is made from alloy steel, specially forged and heat treated to withstand contact with hot rivets and reduce breakage.



Some New Members of the "Barnes" Family

THE Barnes Drill Co., of Rockford, Ill., have recently announced the addition to their line, of a number of new tools, some of which are shown below.

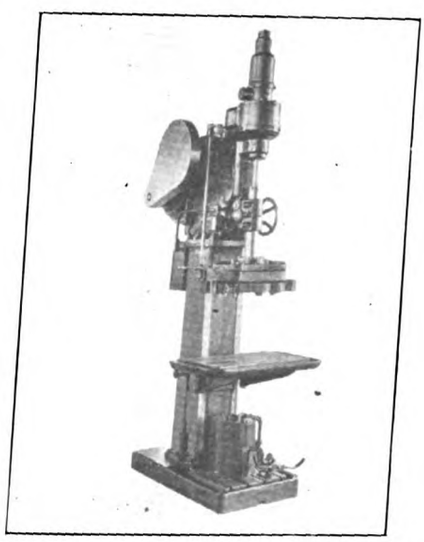
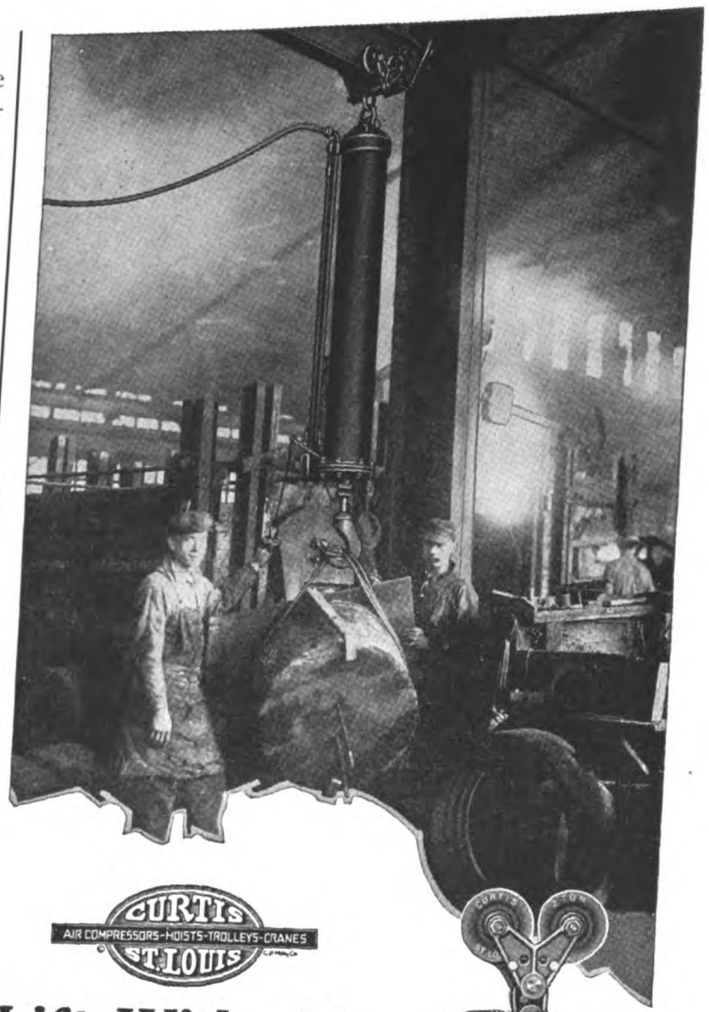


Fig. 1. New Barnes No. 211 Honing machine, for refinishing motor cylinders by the honing process. The machine shown has a four-spindle head for finishing four cylinders simultaneously, but is regularly furnished in single spindle construction. Table has a normal vertical stroke of 5 inches.



CURTIS
AIR COMPRESSORS-HOISTS-TROLLEYS-CRANES
ST. LOUIS

Lift With Air

Economical—Safe—Speedy

Compressed air provides economical power for the safe, speedy lifting and transfer of heavy castings structural shapes, machines, assemblies or parts.

Curtis All-steel Air Hoists and Roller-bearing Trolleys make use of power already available in most plants. With them you can keep your production keyed to the proper point—you can move materials between machinery or assembly operations with the necessary rapidity—keep your labor cost at its proportionate level. You save time, energy and men—before, during and after machining operations.

Curtis Hoists are safe and positive in action—with Curtis I-Beam Trolleys a 4000-lb. load can be moved by a 50-lb. pull.

Furnished in capacities up to 20,000 lbs. and in various types to meet particular needs. Send for complete data.



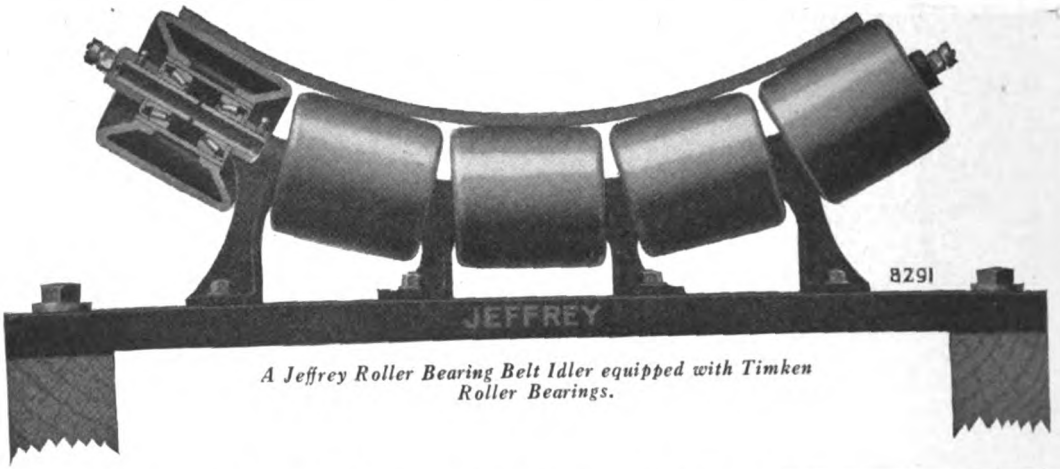
CURTIS PNEUMATIC MACHINERY CO.
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CURTIS
Air Hoists *and* Trolleys

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Jeffrey Belt Conveyors

For Bulk Material and Packages



A Jeffrey Roller Bearing Belt Idler equipped with Timken Roller Bearings.

JEFFREY Improved Roller Bearing Belt Idlers are the result of the latest and best engineering experience. They are economical in first cost and trouble free. Bearing friction is practically eliminated and the life of the belt greatly increased.

You will be interested in the following points of construction:

1—Timken Roller Bearings in every pulley.

2—Grease seals hold the lubricant and keep out dirt and grit.

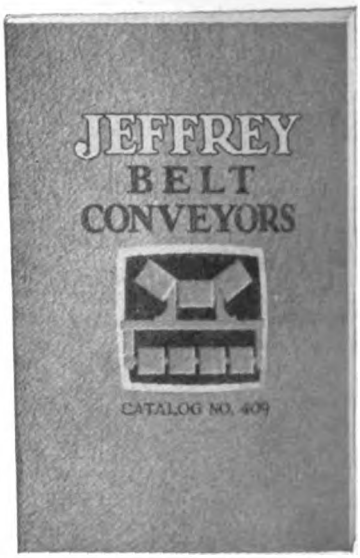
3—High pressure greasing system with grease fittings easily and safely accessible, even when belt is running.

4—Well balanced cast iron pulleys withstand wear and exposure to all kinds of climates.

5—Pulleys mounted on steel channel bases, will not get out of alignment.

6—Proper curvature to conform to troughing of belt.

7—Built to stand heavy service in handling sand, gravel, stone, ore and similar materials.



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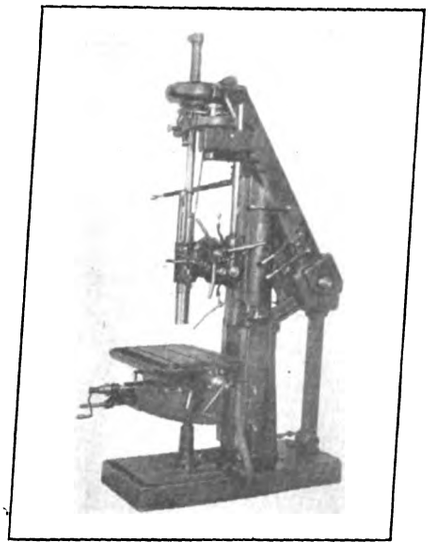


Fig. 2. Barnes No. 263 All Geared Drill and Tapper. This new machine has a sliding head, eight changes of geared speeds and feeds, and is self oiling. It will handle high speed twist drills to two inch diameter at suitable speeds and feeds, and bore cast iron up to 8 in. diam.

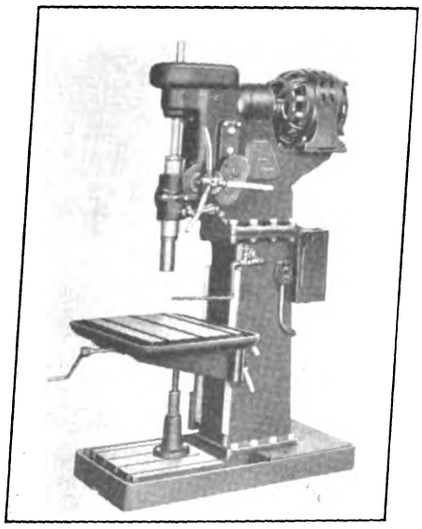


Fig. 3. "Super-production" drilling and tapping machine is the term given to their new No. 210 by the Barnes Drill Co. The illustration shows it equipped with motor drive. The capacity is from ⅜ to 1½ inch twist drills. It drills to the center of a 21 in. circle.

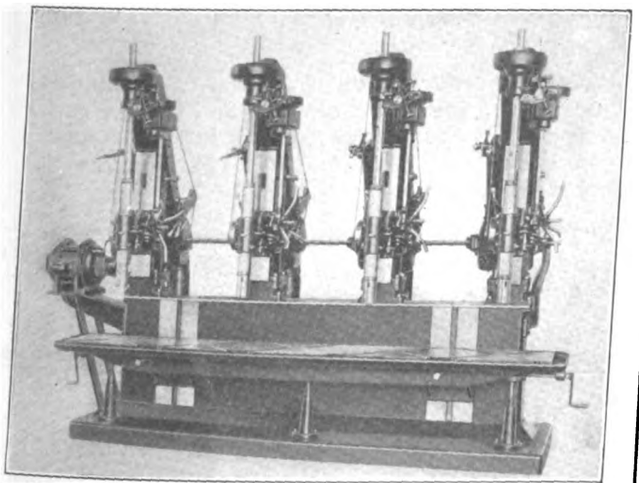


Fig. 4. Both the new Barnes No. 263 and No. 210 drills are also mounted in gangs with either round or square individual, or "one piece" rectangular tables. A "gang" of 263's with rectangular table is shown above.

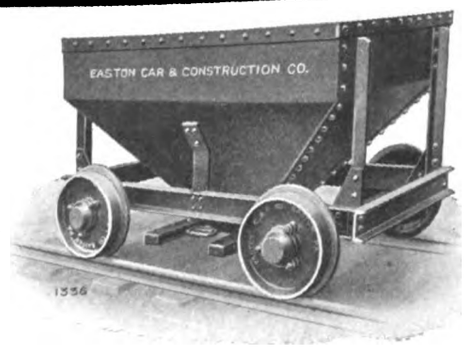


Fig. 1336

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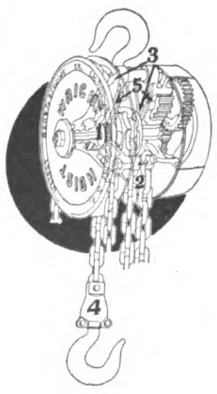
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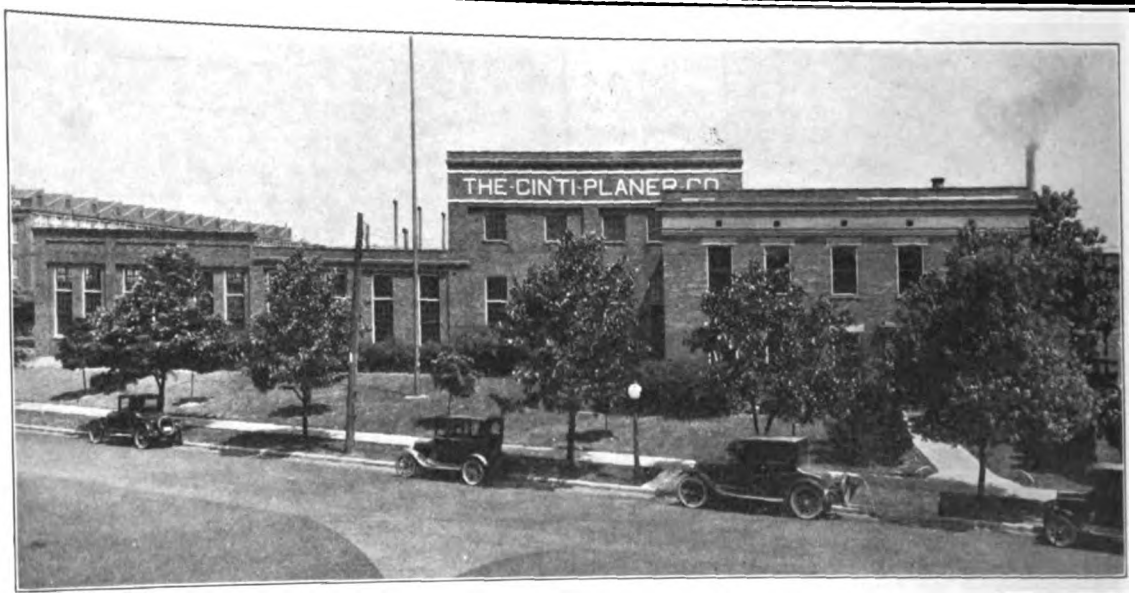


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"Our Invincible Portable Vacuum Cleaner has been in steady use since 1918. In spite of the fact that it is constantly used to pick up metal dust, filings and clippings, it has never required a cent's repairs except for a new hose.

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"Our Invincible is also very handy for getting at the inaccessible places in our machines. It improves general working conditions in the plant, because the dust and filings are drawn into the cleaner instead of being blown about the shop. Reducing the amount of metal dust in the plant also helps protect the highly polished metal surfaces on our planer beds, boring mill tables, etc.

"Another important use for the Invincible is keeping our tool room shelves and bins clean—an operation that formerly took much time and then could not be done with any degree of thoroughness.

"The ordinary vacuum cleaner could not stand up under this type of work, nor would it be anywhere near as efficient."

Invincible Vacuum Cleaner Mfg. Co.

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Recent Additions to the Landis Line

THE Landis Machine Company, Inc., of Waynesboro, Pa., have recently enlarged their line by the addition of several machines for pipe and bolt threading.

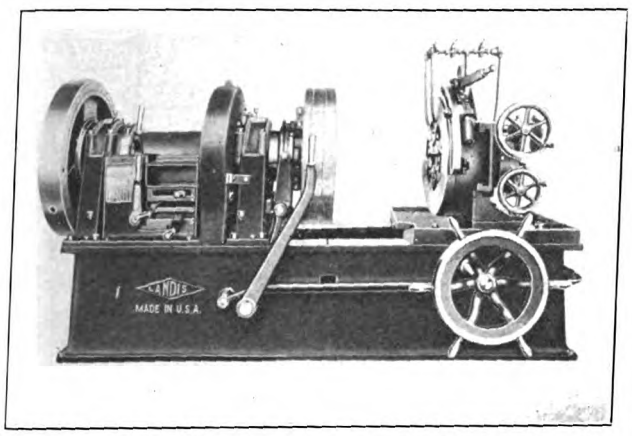


Fig. 1. The operating side of the new Landis 6″ pipe threading and cutting machine. Its range is from 1″ to 6″ with two die heads. There are eight geared speed changes. Front chuck is universal and is lever operated and rear chuck is a general universal fitted with flange grips for screwing flanges on and off, reverse drive being provided for this purpose. Also designed for motor drive with 7½ hp. motor.

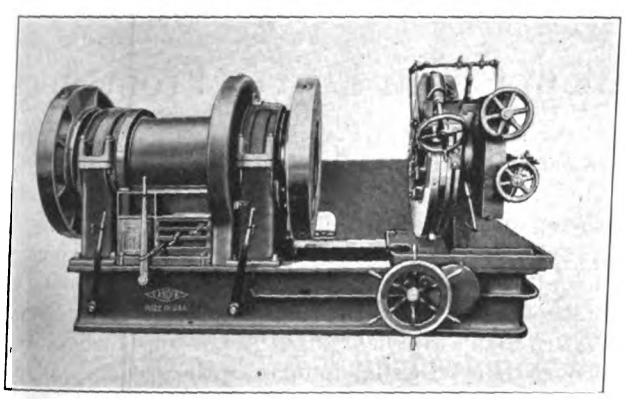


Fig. 2. Twenty inch pipe threading and cutting machine just added to the Landis line. Range from 10″ to 20″ with one die head. The operating cone of the driving clutch is controlled by two levers at the ends of the head stock. The middle lever is for reversing. Hand and power carriage movement.

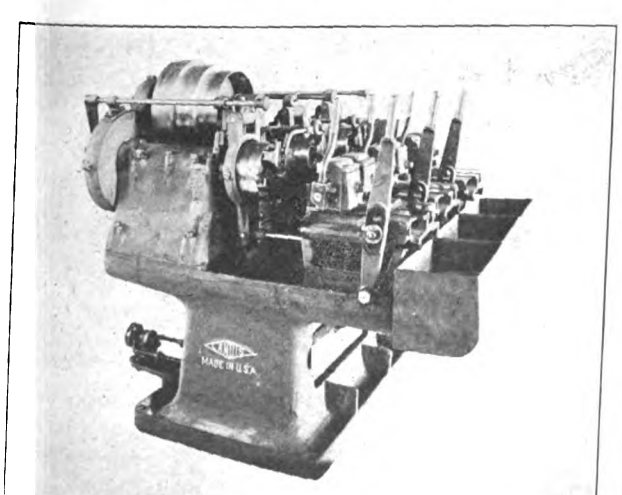
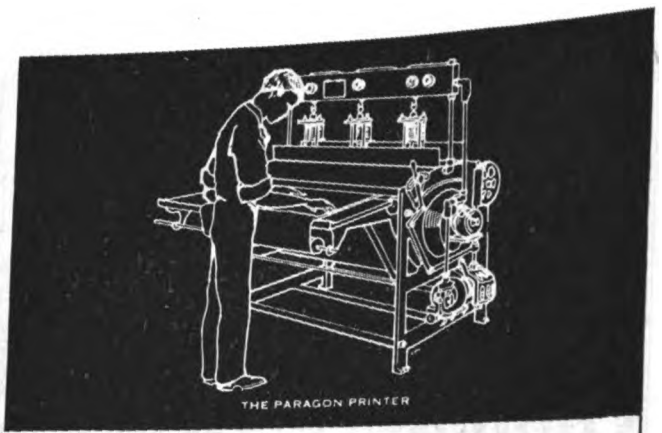


Fig. 3. This new bolt threading machine is designed for bolt factories or other concerns with large scale bolt requirements. It is made with both double and triple heads in sizes from 1 to 1½″, and double head only in the 2″ size. The carriages are provided with either bolt holders or vise grips—the latter being shown on the machine above.



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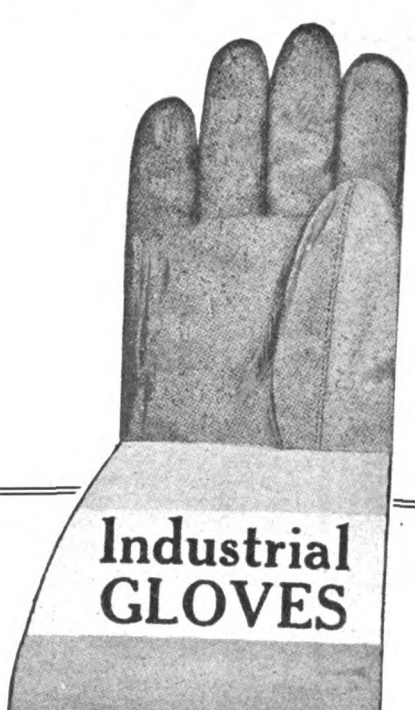
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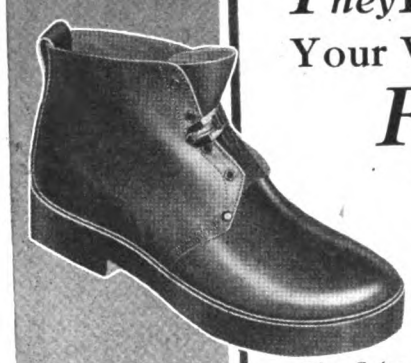
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Davenport Wood Sole Shoes

These consist of new 6-inch and 20-inch pipe threading and cutting machines, a new double and triple head threader for bolt factories, and a new reverse taper die head for cutting tapered threads or crown bolts. These tools are shown in the accompanying illustrations.

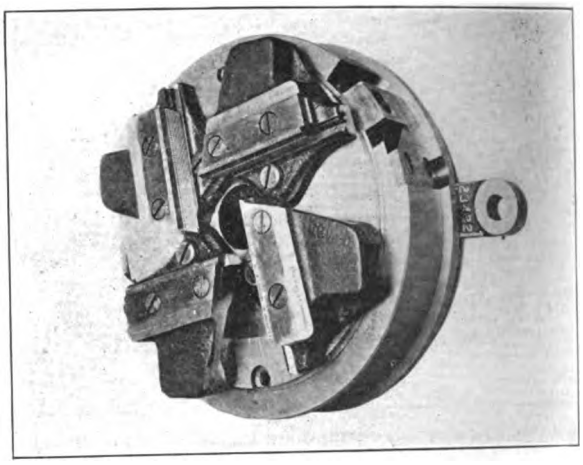
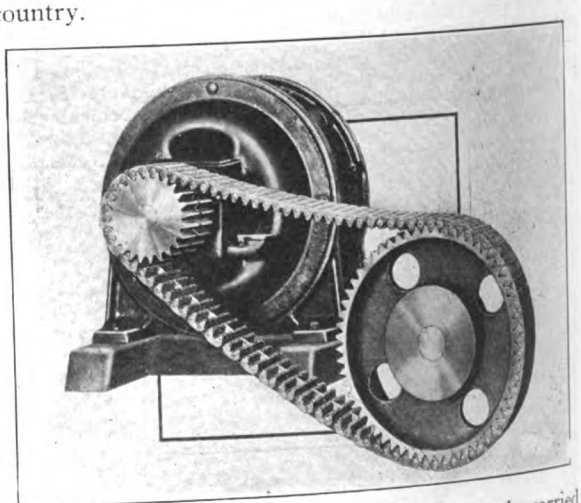


Fig. 4. This new die head is designed to cut tapered threads or crown bolts. It cuts from the big end toward the small end of the bolt, thus eliminating the danger of nicking the bolt body. Maximum diameter of bolt threaded is 1⅞", and maximum taper is 2" per foot.

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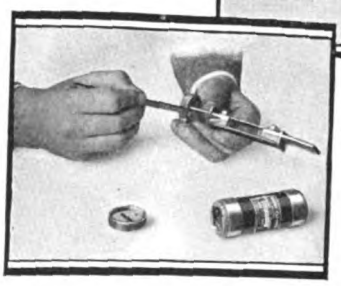
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Note the substantial construction of the knife-blade member.

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9. *Fusion occurs midway between contacts—connecting parts are always clean. Link is notched at both ends and held down by studs and washers. Studs thread directly into knife-blade member—no clogging by molten fuse metal because threads are unexposed.*

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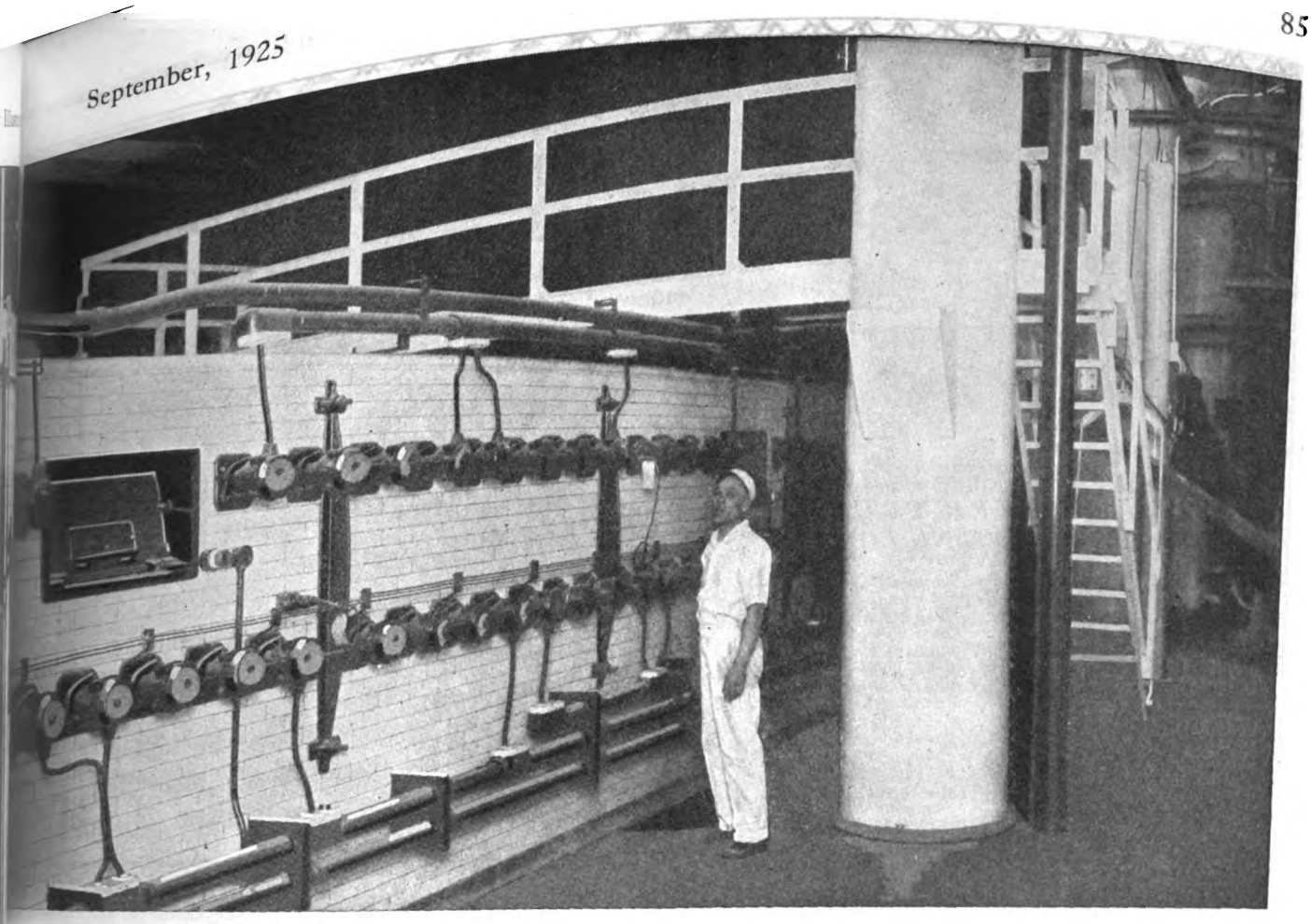
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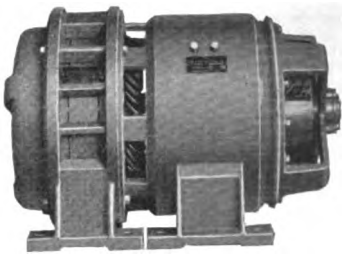
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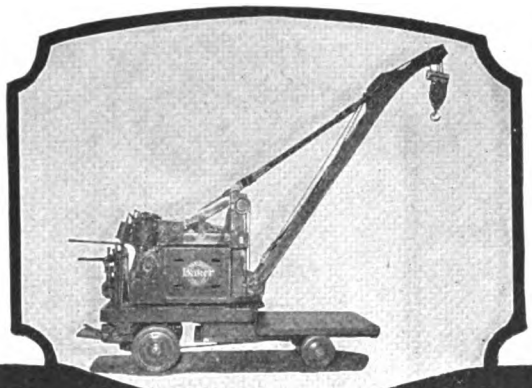
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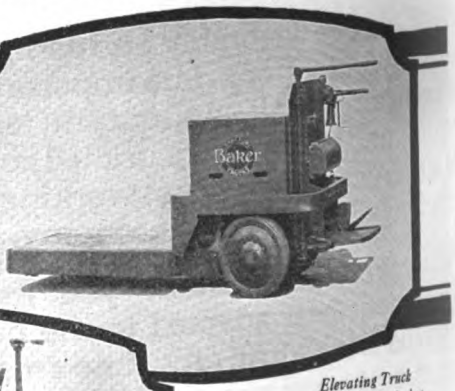
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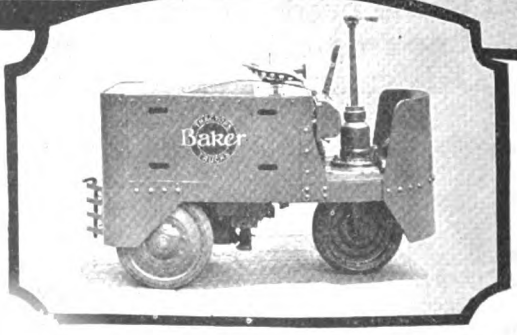
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By Charles W. Geiger.

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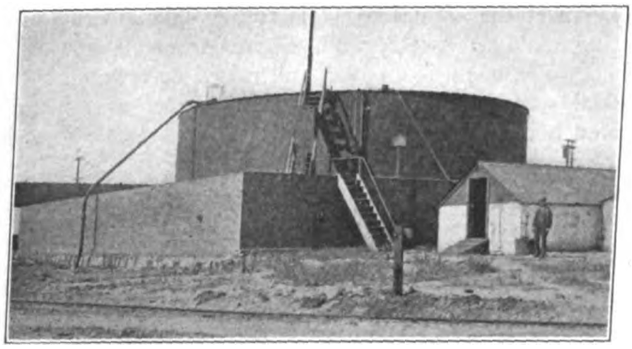


Fig. 1. The oil runs by gravity from the large storage tank to two steel tanks in a concrete pit near the tracks. While one is under air pressure, the other is being filled; the operation being automatic.

is handled by gravity and compressed air, all operations being entirely automatic.

The oil is stored in a large steel tank shown below. Two steel tanks are placed in a pit at such a level that the oil will run from the main storage tank to the two tanks by gravity. The oil is forced from these two tanks to the oil loading column by compressed air, the entire operation being automatic. The oil in one of the steel tanks is always under air pressure, while the other is being filled. When the oil from the main stor-

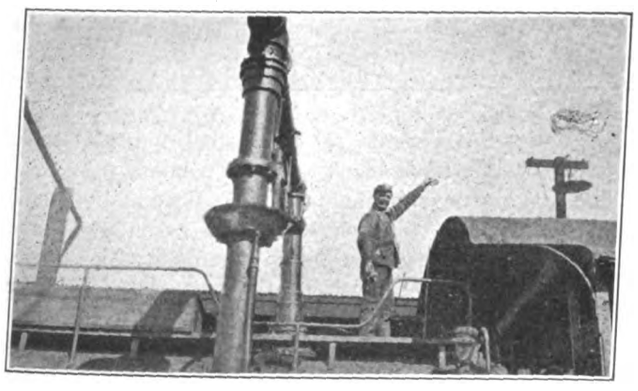


Fig. 2. The simplicity of taking on fuel from the locomotive filling station; like taking on water in the old days.

age tank fills the smaller tank to a certain level, the oil is automatically shut off from this tank and turned into the second tank. Simultaneously with this movement, compressed air is turned into the filled tank, and the air pressure in the second tank released, which permits this tank to fill while the other tank is being discharged. This process is continued automatically without any assistance from any outside source.



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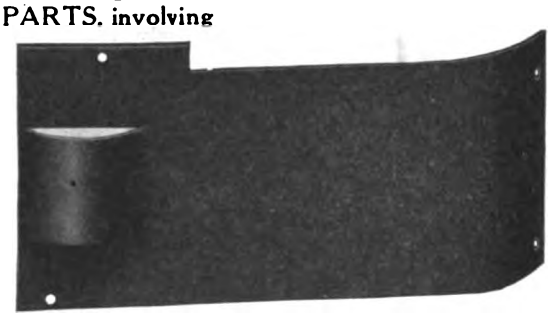
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HOW AND WHY CAMPBELL SOUP CO. Use The Productimeter

"Most of the Productimeters are installed on the belt conveyor lines which carry the cans from the filling machines to the baskets, in which they are placed preparatory to cooking in steam retorts. During our busy season the maximum count reaches three million cans a day. This is strenuous service for the counters.

"All equipment connected with the production and conveying of the soup is washed with hot water and live steam every night. The Productimeters have to go through the same sanitary treatment as the other equipment, and are thoroughly soaked.

"We also use Productimeters on our labeling machines to count the number of cans labeled. The difference between the number of cases actually packed, and the recorded total number of cans received from the labeling machines, gives us the number of re-labels necessary. This affords a check on the efficiency of our labeling machines."

(3149)



DURANT Manufacturing Company

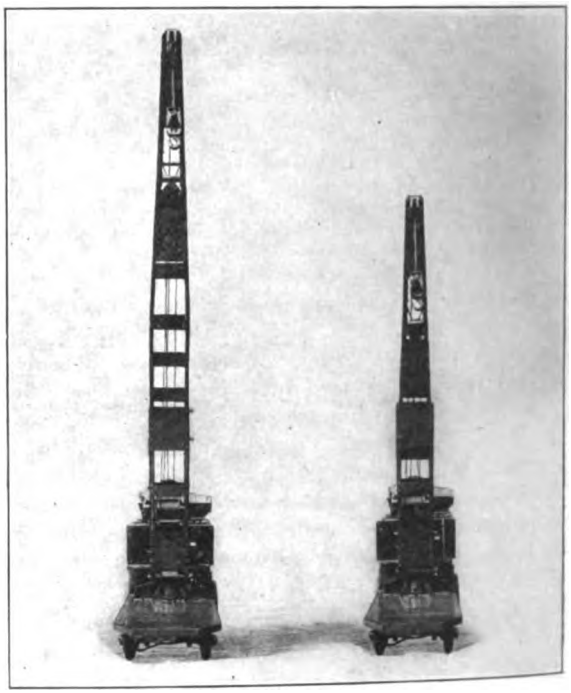
608 Buffum St.
Milwaukee, Wis.

New Catalog No. 46 is ready. Tell your secretary to ask for one today and have it ready in your files

Portable Electric Crane—Telescoping Boom

THE latest improvement to the Elwell-Parker Type CK Portable Electric Crane is the telescoping boom. Many users have found that an especially long boom is at times a hindrance rather than a help, while with a short one there are frequent calls for a lift beyond the boom range.

To meet this situation a telescoping boom with four settings between twelve and seventeen feet is now offered. The boom is all steel and raised or lowered by a special set of cables operated from an electric motor driven hoist unit with two grooved drums. The second



drum carries the separate ⅜" plow steel non-twist cable to two part line hook block sheave on boom tip.

The heavy boom side channels are latticed and gusseted with a continuous ¼ inch steel plate extending above from the hoist cable sheave to the boom elevating sheave, i. e. throughout the length of the curved head of the boom.

The lower box or enveloping section of the boom is of formed plate steel, providing a very stout support for the telescoping portion.

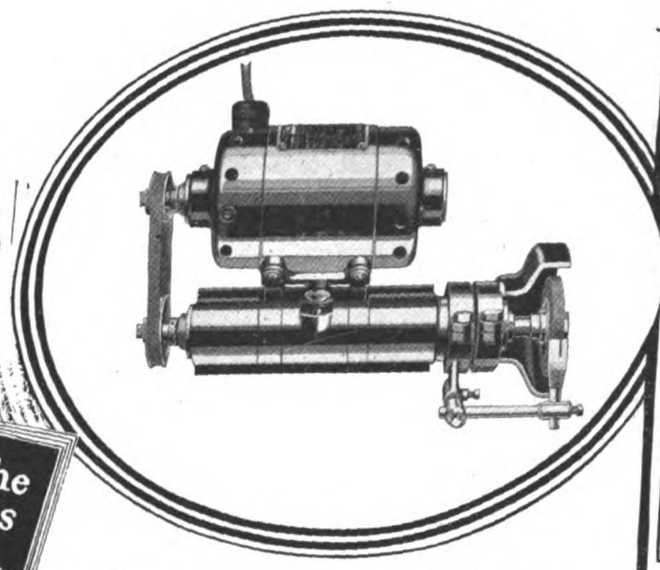
A feature of this boom is that the distance from top of boom to the hook is but 23 inches. This has been accomplished by suitably locating the trip switch. The advantages of this design are apparent when handling in low head room or reaching over a gondola car or motor truck.

The battery compartment carrying hoist unit counterbalances the boom with load on a steel crane column supported on ball and roller bearings. This column is set in heavy pedestal firmly anchored in main frame. The boom may be furnished with either hand or motor slew as required.

All the Elwell-Parker safety features are incorporated in this latest design.

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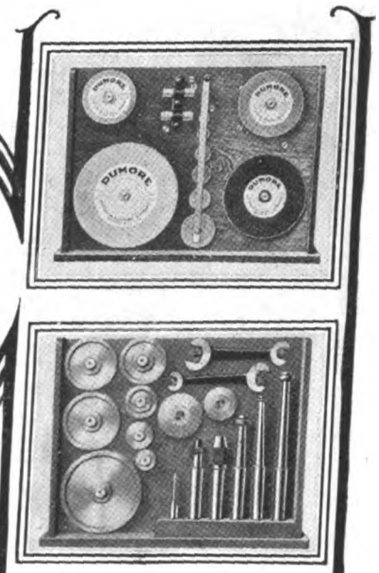
Dumore No. 3—Multi-Speed Grinder

This Book Shows Grinding Stunts that Cut Costs

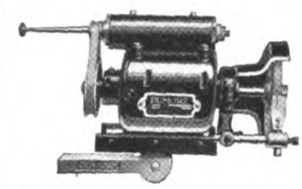
—Send for Your Copy Today!

CHUCK full of time and money-saving suggestions — containing actual photographs of grinding set-ups that have cut costs for others—showing how efficiently Dumore grinders do "the jobs that can't be done," our new book, "Hitting the High Spots," will prove mighty interesting to the man who likes to do good work—*quickly* and *economically*.

Regardless of the kind of work you do—irrespective of the nature of your business, if you maintain a tool-room or machine shop you'll find this book a real help in unsnarling those "stump" problems that come up so often. And all these valuable hints are free for the asking. Just fill out and send us the handy coupon below. Your copy of "Hitting the High Spots" will be sent by return mail. But start the coupon on its way today. The books are going fast!

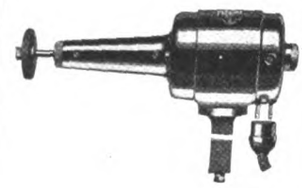


Wheel & Spindle Equipment Furnished with Dumore No. 3 Multi-Speed Grinder



Dumore No. 2—AG Grinder

For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R. P. M. Self aligning ball bearings. Comes completely equipped.



Dumore No. 1—JG Grinder

An inexpensive tool for garage, repair shop or tool-room. Speed 15,000 R. P. M. Length of arm 4¼". Extension spindle 2". Grinder pivots on base.

A Few Dumore Grinder Advantages

Six distinct styles of Dumore grinders, each with individual speed ranges, provide a grinder with the correct cutting speed for any grinding need. Dynamically balanced armatures and selected ball bearings in Dumore grinder motors eliminate vibration—permitting maintenance of grinding limits as close as .0001, without taper, bell-mouth or chatter marks. Operating on alternating or direct current, these sturdy grinders are especially useful in shops supplied with two varieties of power current. Easily portable, they save the cost of tearing down expensive set-ups.

WISCONSIN ELECTRIC COMPANY, No. 70, 16th St., RACINE, WIS.

DUMORE

HIGH SPEED GRINDERS

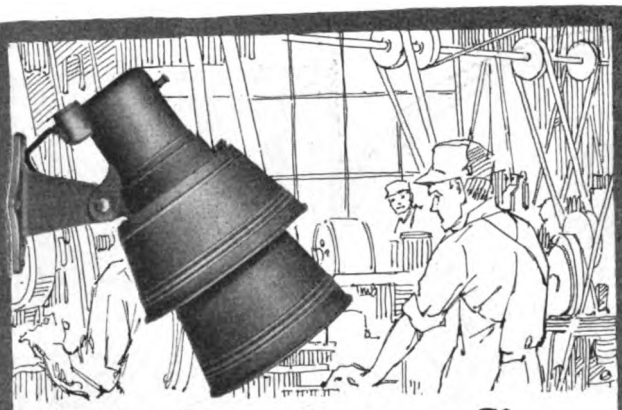


Wisconsin Electric Company
70, 16th St., Racine, Wis.
I'm interested in cost-cutting grinding stunts and short cuts. Send me your booklet, "Hitting the High Spots."

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My title is.....

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This Great Factory Siren Will Save Many Dollars!

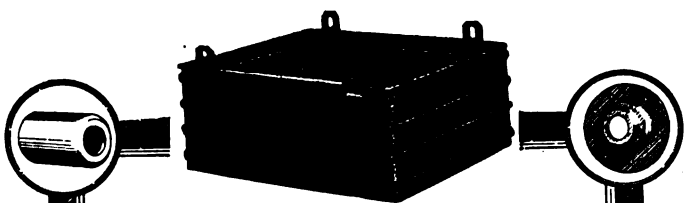
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The Sterling Siren is the most effective signal yet devised for factory use. It is the most simple and economical apparatus that can be installed. Can be attached anywhere to wall or beam and plugged into any ordinary electric light socket. It can be connected to your time clock and still be placed anywhere in your factory, and as the clock hands reach the work hour the penetrating signal is set off. There is no lagging, for the Sterling Siren awakens the whole force and machines are instantly set in motion.

Write us now for full particulars and special approval offer. Try the Sterling Factory Siren at our expense. It will soon pay for itself in time saved.

$35. COMPLETE

THE STERLING SIREN FIRE ALARM CO., Inc.
50 Allen Street Rochester, N. Y.



Eliminate Needless Shop Operations

THE CUTTING of just one superfluous material handling operation will increase your profits.

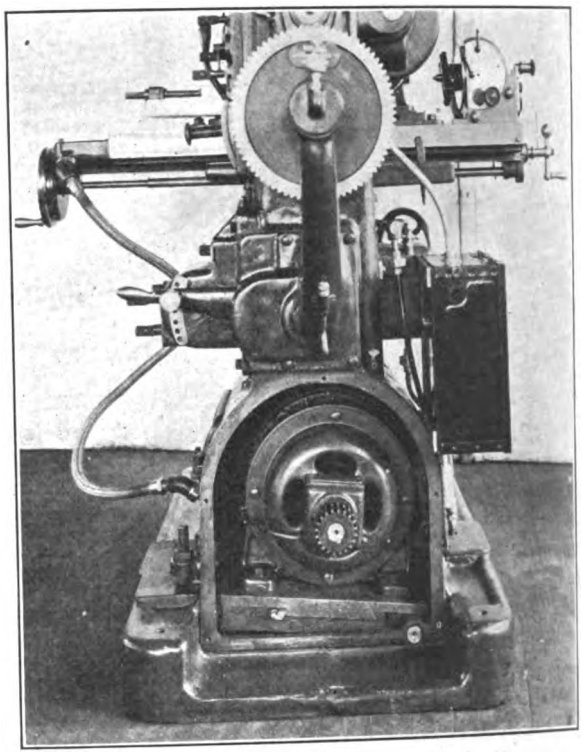
Use POWELL Pressed Steel Material Handling Equipment to speed up your production and minimize your costs.

Send for new folder illustrating our complete line of Material Handling Equipment.

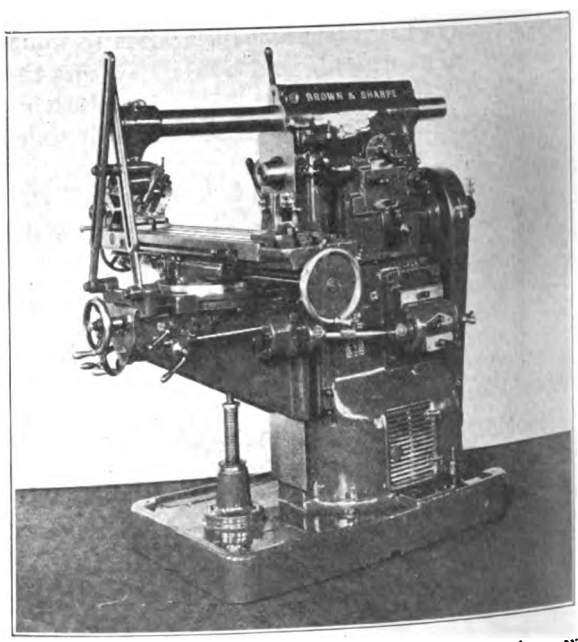
The POWELL PRESSED STEEL CO.
HUBBARD, OHIO
SUBURB OF YOUNGSTOWN

New B. & S. "Motor-in-the-Base" Milling Machines

BROWN & SHARPE MFG. CO., of Providence, R. I., have recently put on the market this new "motor-in-the-base" milling machine. The motor is enclosed in a compartment cast in the lower part of the column. Complete protection from oil, cutting lubricant, chips, etc., is provided for the motor as the compartment is oil-tight, being cast with a solid top.



Provision has been made to insure a sufficient circulation of air by means of three ventilators located on the sides and rear of the compartment.



A tank for cutting lubricant is located in the base, extending around the foot of the elevating screw.

The accompanying illustrations show the ease with which the motor can be removed. These machines are also adaptable to drive from a main lineshaft.

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Quality Facts About Belting

WHY SCHIEREN BELTS LAST LONGER

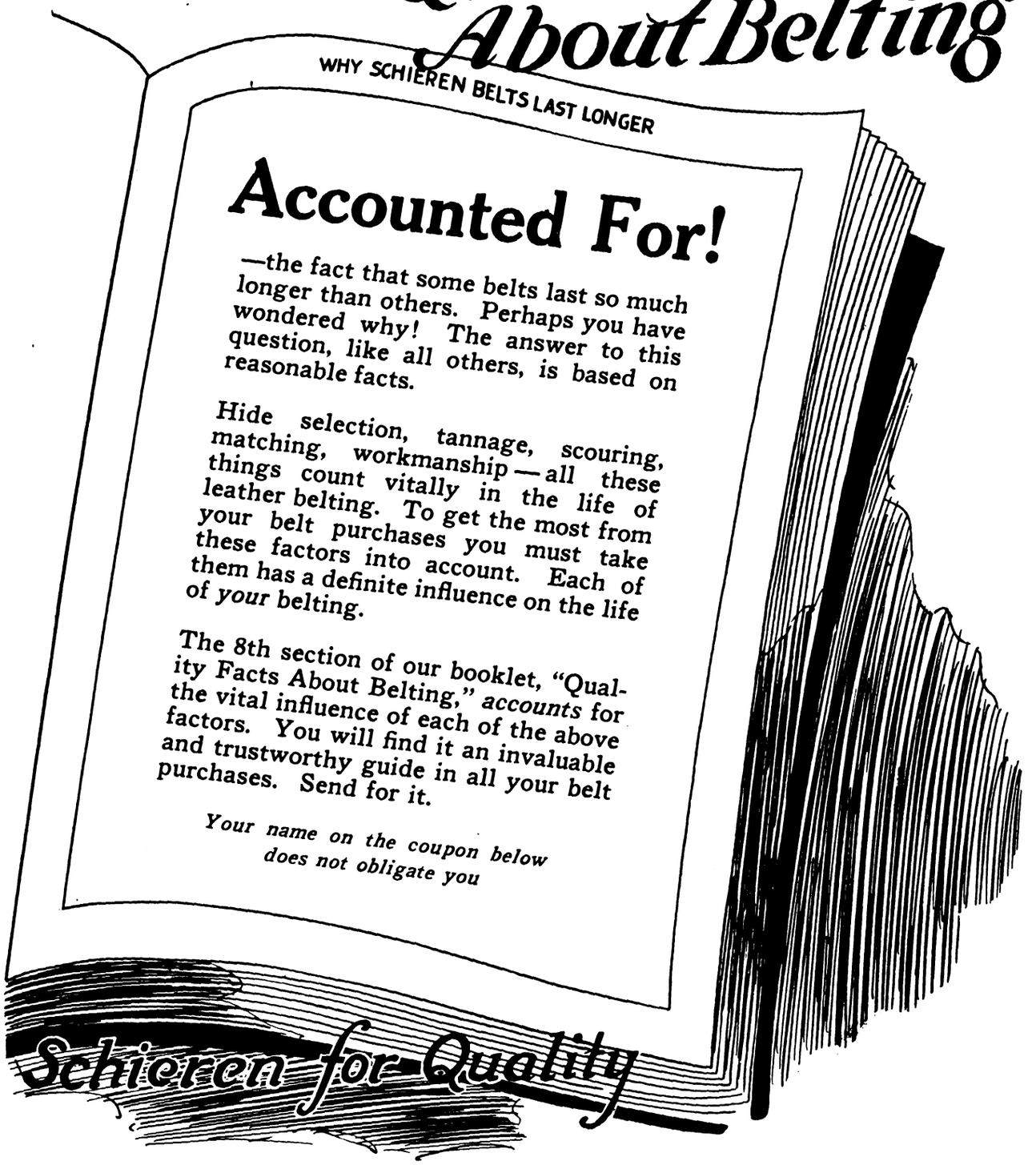
Accounted For!

—the fact that some belts last so much longer than others. Perhaps you have wondered why! The answer to this question, like all others, is based on reasonable facts.

Hide selection, tannage, scouring, matching, workmanship — all these things count vitally in the life of leather belting. To get the most from your belt purchases you must take these factors into account. Each of them has a definite influence on the life of *your* belting.

The 8th section of our booklet, "Quality Facts About Belting," *accounts* for the vital influence of each of the above factors. You will find it an invaluable and trustworthy guide in all your belt purchases. Send for it.

Your name on the coupon below does not obligate you



DUXBAK BELTING
TRADE MARK

Chas. A. Schieren Company
ESTABLISHED 1868

Tanners
Belt
Manufacturers

Main Office and Factory
31 Ferry Street, NEW YORK, U. S. A.

Branches and Distributors in All Leading Cities

Gentlemen: Kindly send me, without obligation, your series of "Quality Facts About Belting."

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Signed by .....

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"Buffalo" Equipment For Every Shop

Whenever you're in the market for forges, drills, punches, shears and bar-cutters, blowers, exhausters or combination wood-working machines remember that there is a Buffalo to fit your particular requirements. Backed by more than 45 years of manufacturing experience, every Buffalo machine represents the greatest possible VALUE!



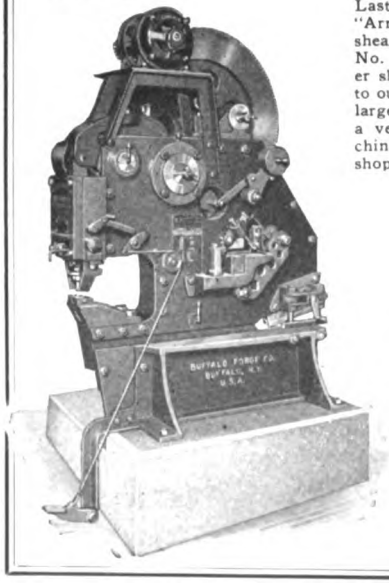
The Buffalo No. 210 Rivet forge shown at the left is a favorite with contractors from coast to coast. Has a heavy, deep one-piece steel plate hearth, without seams of any kind. Hearth is rust-resisting, unbreakable and light. Blower is the Buffalo No. 200, guaranteed against wearing out for 10 years.



The No. 236-H forge is used for manufacturing and repair work. Hearth is one piece seamless steel plate, 24x24" by 5¾" deep. This forge is light but very strong. Can be packed for shipment in small space.



We make a very complete line of drills for power and hand operation. The 21" shown here drills to center of 21" circle, has a long travel of spindle (12½") gear driven power feed, and many advantages.



Last of all, the Buffalo "Armor-Plate" punches, shears and Bar cutters. The No. ½ Universal Iron Worker shown is a recent addition to our complete line, has very large capacities, and sells at a very low price. This machine will save money in any shop that fabricates metal.

Write for our catalogs, mentioning the machines you are interested in.

BUFFALO FORGE COMPANY
440 Broadway
BUFFALO N. Y.

Doing the Impossible—at a Profit

MANY things are being done in this day and age which would have been considered impossible five years ago. For example, the accompanying illustration of an actual installation, together with this text describing an "impossibility," proves what can be accomplished with present equipment and under present conditions.

This illustration shows a smooth belt conveyor, eighteen inches wide and sixty feet long, successfully handling plaster at an angle of 44 degrees, up and into the third story of the Mitchell Junior High School in Denver. The contractors using this equipment are Henry & Feely, sub-contracting under Mr. P. J. Sullivan, Thirty-second and Humboldt Sts., Denver, Colo.

In this installation, the mortar or plaster is mixed by one man using a mechanical mixer, and is discharged to the belt conveyor, which in turn carries it to the inside of the building through a window, and discharges it into a large wooden hopper. Under the hopper, a small one-



quarter yard car on a narrow gauge track receives the plaster as it is dumped, and by this method both plaster and mortar are distributed throughout the building at each floor level. By this installation the contractors have cut down the number of men formerly employed and the gang has been reduced from fifteen to three, thus saving the wages of twelve men.

Due to outside working conditions, this conveyor is driven by a 15 hp. gasoline engine and in order to make it work smoothly a wiper is provided at the head end to clean the belt. This consists of a piece of rubber belting firmly held between 2 x 4's with the edge against the return belt.

More and more we find materials handling equipment being accepted by all trades and industries, both for reducing labor costs and lightening the burden of the workman.

THE wage question continues to dominate present attention among the internal industrial problems, but only slightly more than the tax problem does among the external problems. Both major political parties have asserted their intention to reduce taxes and the question before Congress, it appears, will be, how far and for what particular classes shall taxes be reduced. The recognition is growing that business must get down to a lower cost basis.—*Industrial News Survey.*

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"Give and Take" is the principle of the new Bassick Ruboid Wheel

Reg. U. S. Pat. Off.



Iron

Something's *got* to *give* —the floor does!



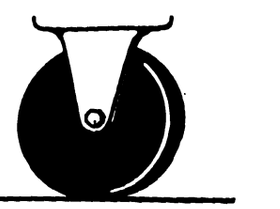
Steel

Something's *got* to *give* —the floor does!



Wood

Something's *got* to *give* —the floor does!



Ruboid

Something's *got* to *give*—the Ruboid Wheel does! Quietly, easily, noiselessly, it rolls without harm to floors. No wonder—look how it is made.

RESILIENCY with rigidity! That's what a truck caster wheel should aspire to and that's exactly what the Bassick Ruboid Wheel has attained.

Look at it! See those laminations of tough, sinewy wood held fast in a solid mass of vulcanized rubber. Ply by ply, Ruboid Wheels are built. Rubber, then wood—rubber then wood—and the whole mass solidified by vulcanizing.

Strength? Yes, burden-bearing strength. Sizes for heavy loads—sizes for light loads—and all roll easily, roll smoothly.

Wear? Yes, Ruboids will outwear most any other truck caster wheel but they won't wear out your floors . . . they believe in taking the bumps—not giving them.

Silence? Well, what is more silent than rubber—what is more resilient than rubber—what is easier on floors than rubber—and yet no other wheel rolls easier. Resiliency with rigidity—Bassick Ruboids.

"Give and take." If you believe in it, "give" Ruboids a trial—they'll "take" the bumps out of *your* trucking problem forever.

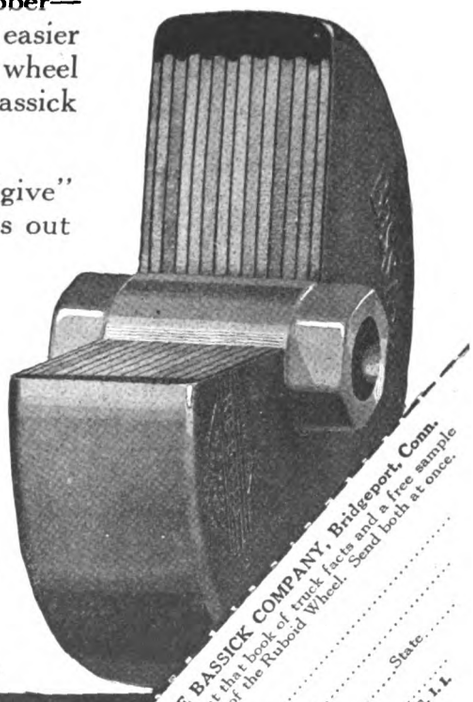
We want to give you this book—will you take it?



Full of facts about truck wheels you have every right to know. Send for it and a free sample section of Ruboid Wheel.

SEAMLESS
RUBOID
RUB-WOOD
PAT. 1458 379
REG. U.S. PAT. OFF.

THE BASSICK COMPANY, Bridgeport, Conn.



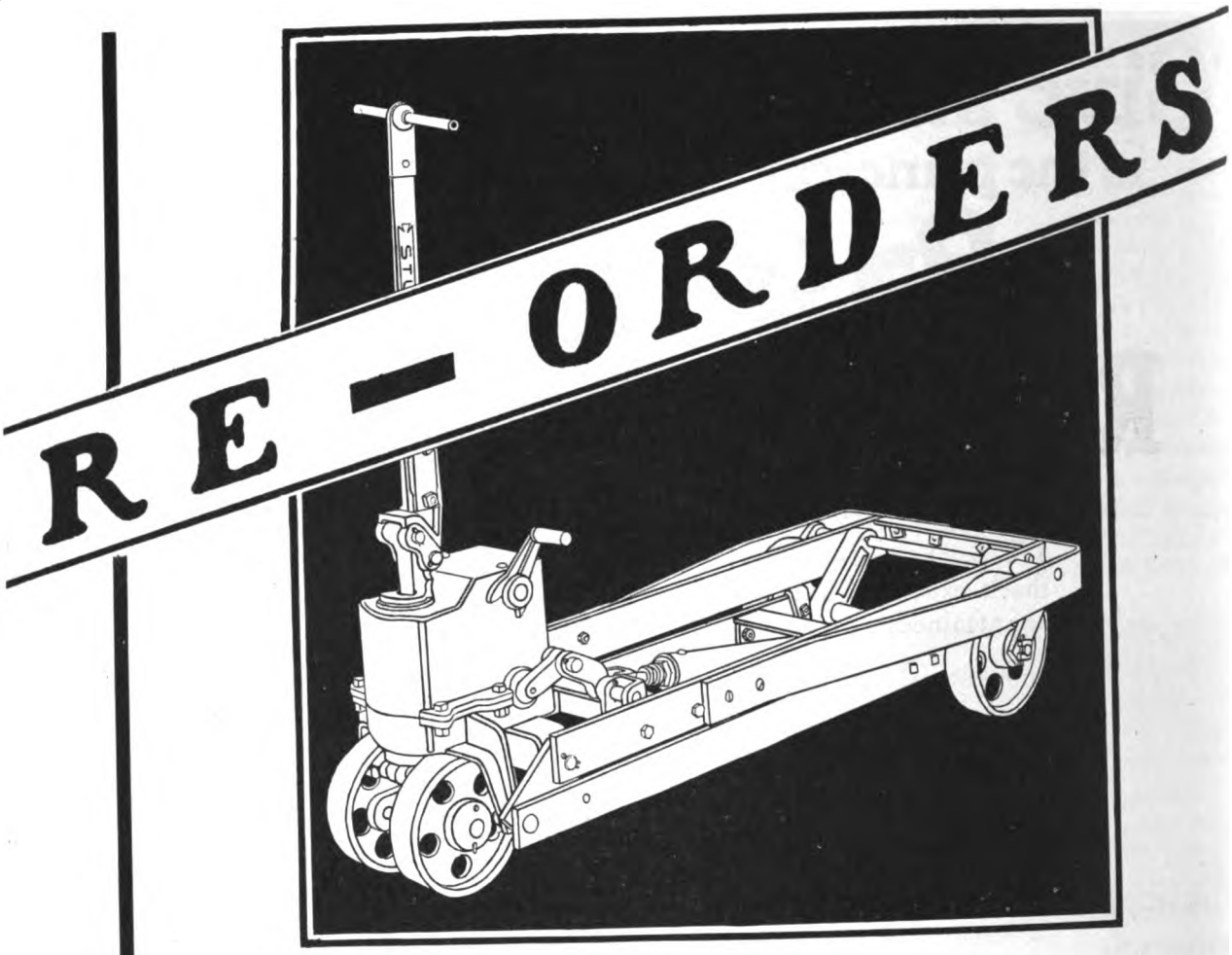
THE BASSICK COMPANY, Bridgeport, Conn.
We want that book of truck facts and a free sample section of the Ruboid Wheel. Send both at once.

Name .....
Address .....
City ..... State .....
Business .....



Ruboids Roll Easily ~ ~ Silently!

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Ten More From Chevrolet

The above re-order for a half dozen more Stuebings for the Detroit plant was received in July. Four more were re-ordered for the Flint plant in August. Still other re-orders are pending.

Great industries appreciate the following points of eminent superiority over other trucks, possessed by this greatest of all Stuebing products—the K model.

1—60 to 1 lifting power.
2—Lifts from any point of the compass.
3—High lift—load movable at any point of elevation.
4—Safety—handle cannot fly up to cause injury.
5—Timken Thrust and Hyatt Bearings assure *easy steering and rolling.*
6—Lifting mechanism enclosed and operates in lubricant—insures long life—aids easy lift.
7—Durability—all steel construction, including steel wheels. Strength with lightness. All parts machined—standardization—interchangeability.



Stuebing Steel-Bound Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble

We will be only too glad to furnish a K Model for comparison without obligation. Write us and tell us size desired, and when and where to send it.

STUEBING TRUCK COMPANY, Cincinnati, Ohio

StueBing

LIFT TRUCK SYSTEMS

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Drinking Fountains

Two booklets on Sanitary Drinking Fountains of the gravity and pressure types and Sanitary Ice-Cooled Bubbling Fountains for attachment to city water supply, have been issued by the Century Brass Works, Belleville, Ill.

Anti-Slip Treads

Feralun and Bronzalun Anti-Slip Treads are described and illustrated in bulletins issued by the American Abrasive Metals Co., 50 Church St., New York.

Pressed Steel Material Handling Equipment

including standard platforms, box-platforms, platform boxes, etc., is described in an illustrated folder issued by The Powell Pressed Steel Co., Hubbard, Ohio.

Wood, Board Hammer and Motor Pulleys

are described in literature recently issued by the Saginaw Mfg. Co., of Saginaw, Mich. One of these booklets in addition to illustrations and description of various types of pulleys contains complete price lists.

Safety Lowering Switch

The Thompson Safety Lowering Switch or Disconnecting Hanger, enabling high lamps to be lowered away from the electric circuit for cleaning and renewals, is described in a bulletin issued recently by the Thompson Electric Co., 226 St. Clair Ave. N. E., Cleveland, Ohio.

Combustion Efficiency Instruments

The Jos. W. Hays Corp., Michigan City, Ind., has issued an illustrated folder describing the Hays Automatic CO_2 and Draft Recorder, Draft Gages, Flue Gas Analyzer, etc.

Sagger Clay

A booklet on H. W. R. Sagger Clay has been issued by the Harbison-Walker Refractories Co., Pittsburgh, Pa.

High Pressure Lubricating System

An illustrated booklet describing the "Dot" High Pressure Lubricating System has been issued by the Carr Fastener Co., 31 Ames St., Cambridge, Mass.

Truck Cranes

A 16-page illustrated booklet, No. 36, on the subject of O-S Type "V" Cranes for mounting on motor truck chassis, road wheels, flexible crawling treads or rail wheels, has been issued by the Orton & Steinbrenner Co., Chicago, Ill.

Mine Fans

of the turbine and disc type are described in a 60-page illustrated booklet on the subject which has been issued by the Robinson Ventilating Co., of Pittsburgh, Pa. Another booklet issued by this company contains 52 pages of illustrations and description of Robinson Turbine Multivane Fans.

Carbon Lamps

Nalco Carbon Lamps are described and price lists published in a folder recently issued by the North American Electric Lamp Co., 1116 South Grand Blvd., St. Louis, Mo.

Ash and Soot Disposal

A 16-page illustrated booklet on the ash and soot disposal at the Milwaukee Sewerage Plant has been issued by the Conveyors Corp. of America, 326 W. Madison St., Chicago, Ill.

Peck Carrier

A 68-page illustrated book, No. 720, describing the Peck Carrier for coal, ashes, cement, sand, ore, stone and other materials, has been issued by the Link-Belt Co., Chicago, Ill.

"Packing Reinforcement Supplies"

is the name of a 22-page booklet containing illustrations and description of the Signode System of Nailless Strapping, published by the Consolidated Steel Strapping Co., Chicago, Ill.

Condulets

Catalog No. 2000, superseding all previous catalogs, contains 714 pages of illustrations and description of Crouse-Hinds Condulets of all series and types. In addition this book contains a catalog number index and a general index, also some description material on other products manufactured by the Crouse-Hinds Co. of Syracuse, N. Y.

Insulation

in the Rock Products Industries and the Insulation of Boilers are described in two illustrated bulletins recently issued by the Celite Products Co., 1135 Van Nuys Bldg., Los Angeles, Calif.

Steam Traps

The A C E Steam Trap is illustrated and described in a bulletin recently issued by the W. B. Connor Co., Inc., 223 West 33rd Street, New York.

Lumnite Cement

A 32-page illustrated booklet describing Atlas Lumnite Cement has been issued by the Atlas Lumnite Co., 25 Broadway, New York.

Industrial Wheels

W & K Industrial Wheels for the Fordson tractor are now cushion tire equipped and these are described in a bulletin issued by the Whitehead & Kales Co., Detroit, Mich. Other bulletins issued are descriptive of the W & K Model C Three Ton Trailer with automatic brake, the Industrial or Shop Trailer, etc.

Sandslingers

The Story of the Sandslinger is the title of an illustrated bulletin issued by the Beardsley & Piper Co., of Chicago, Ill.

Heating Specialties

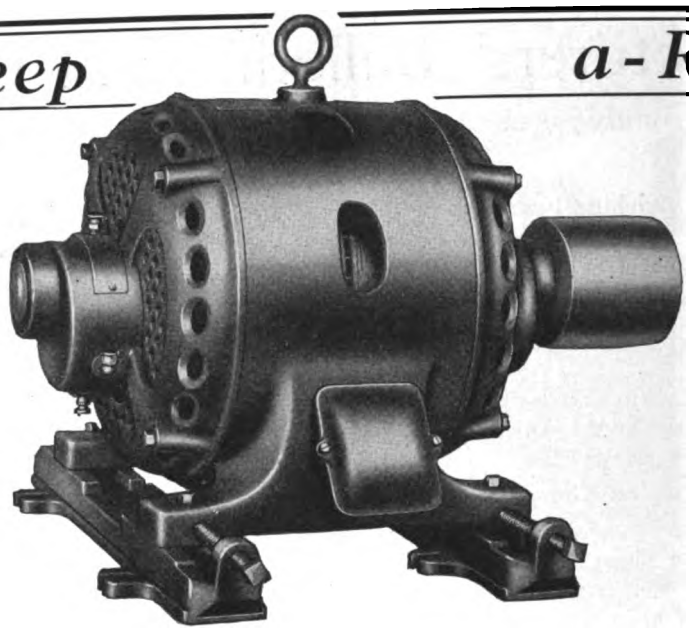
Bulletin No. 14, which contains 16 pages of illustrations and description of Trane Heating Specialties, including the new Trane Bellows-Packless Valve, has been issued by The Trane Co., of LaCrosse, Wis.

Industrial Signals

Bulletin 53 contains 16 illustrated pages of description of Benjamin Industrial Signals, including also howlers, calling circuits, telephone and push button circuits. This has been issued by the Benjamin Electric Mfg. Co., 847 West Jackson Blvd., Chicago, Ill.

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"They keep a-Running"



Bearings That Resist Abrasive Wear

Wherever fractional horse power motor bearings are subject to abrasive wear, Century Squirrel Cage Induction Polyphase Motors are particularly desirable.

First. The filtering properties of the new Century Wool Yarn System of Lubrication prevent any abrasive particles or compounds from reaching the bearing surfaces through the oil wells.

Second. The tight fitting Century brass dust cap and dust collars make Century motor bearing housings as nearly dust tight as it is possible to build them. They remain so throughout the life of the motor.

Third. A cork-gasket-lined cover plate is tightly screwed down over the oil well slot—further preventing the entrance of dust and foreign particles.



Cut-away section showing Century Fractional Horse Power Motor Bearing with new Wool-yarn System of Lubrication. Note how the large oil well is comfortably filled with a series of continuous, unbroken strands of pure wool yarn, looped over the bearing surfaces. Because of the capillary action of the *continuous* wool-yarn strands, oil is constantly being delivered to the bearing, while the filtering properties of the yarn fiber exclude all foreign particles from the bearing surfaces.

The new Century Wool Yarn System of Lubrication is a real engineering advance that permits more than one year's continuous 24-hour-per-day operation without reoiling. It consists of a series of unbroken strands of pure wool yarn, looped over the shaft at the bearings and dipping down into the oil well—the capillary action of the pure wool yarn strands assuring a continuous, even distribution of oil to the bearing surfaces. Since the oil well is especially large and is not fitted with a drain plug at the bottom, oil is conserved indefinitely.

Century Squirrel Cage Induction Polyphase Motors are built in all standard sizes from ¼ to 50 horsepower. Temperature rise not more than 40° Centigrade.

Send for Bulletin 38

Bulletin 38 describes Century Squirrel Cage Induction Polyphase Motors in detail. Folder 580 describes the new Century Wool Yarn System of Lubrication. A copy of each is ready for you—send for them today.

CENTURY ELECTRIC COMPANY

1806 Pine St. St. Louis, Mo.

29 Stock Points in the United States and More Than 50 Outside Thereof

¼ to 50 H.P — Century MOTORS — ¼ to 50 H.P

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General Motors Company building at Detroit, Michigan. Much of the concrete floor in this building is dustless and wearproof because it has been hardened with Lapidolith, the liquid chemical floor hardener. The wood floors of the four-story laboratory connected with the main building, are also smooth, hard and sanitary, for they have been treated with Lignophol, the preservative dressing for wood floors.

Plant maintenance— how to reduce the toll

You can't avoid a certain amount of expense in keeping buildings repaired. But you can reduce this expense by following the suggestions on this page.

FLOORS—Walk on a concrete floor and it seems impenetrable. Yet, unless hardened, that floor in time will begin to dust and wear. If a concrete floor is treated with Lapidolith, the liquid chemical floor hardener, however, it will never dust or wear.

Lapidolith penetrates the concrete when flushed on a floor. It binds the loose particles together, fills the empty spaces, and hydrates the free lime. By chemical action the coarse structure is changed to a fine, dense, even surface of crystalline formation. This surface is permanently dust-proof, wear-proof and waterproof. If needs no further attention. Lapidolith can be applied on either old or new floors. If treated at night the floor is ready for business by morning.

If your floors are of wood you can avoid a lot of trouble by an application of Lignophol. This preservative dressing penetrates the wood and restores its natural oil and gum. It prevents the wood from rotting, splintering or drying out. It does away with the need for frequent applications of floor oil and produces a smooth, hard, dustless surface that lasts for many years.

PAINTED SURFACES—Painting time does not come around so often when interiors are painted with Cemcoat. One reason for this is the durability of this paint; another is that it stays white long after other paints turn yellow. A Cemcoated surface is bright and cheerful. It can be washed over and over again and each time the underneath surface comes forth as fresh and white as the day the paint was applied.

Because of its body Cemcoat usually requires one less coat. Furthermore, it adheres to a brick or concrete wall just as easily as to wood. This is because Cemcoat is not affected by free lime, always present in plaster or concrete and which is fatal to the life of paint. Cemcoat is made for exteriors as well as interiors in white and colors and in gloss, eggshell or flat finishes.

ROOFS—If your roof leaks, stop that leak with Stormtight—the thick, elastic waterproofing compound that sticks to any surface wet or dry. Stormtight permanently repairs a leak in a few minutes. It does more than that, for if you have an old roof about due for replacement it will save you the cost of reroofing. An old leaky roof that is about due for renewal can be made as good as new by a coat of Stormtight. It is easy to apply; it goes over any material; it lasts for years.



The owner of the plant above is saving himself hundreds of dollars by covering his old roof with Stormtight instead of re-roofing. Stormtight will repair a single leak in a few minutes, or it will lastingly waterproof an entire roof as effectively as though you covered the surface with a continuous sheet of thin rubber.

EXTERIOR WALLS—Water will not seep through walls even in the hardest rain storm, if the outside of your buildings is treated with Hydrocide Colorless. This waterproofing material preserves the natural beauty of the brickwork, for its presence can not be detected on a wall. Hydrocide Colorless contains no paraffin; it does not run in hot weather; it penetrates the brick; it does not collect dust; and it can be painted. If you would have warm dry interiors no matter what the weather, use this perfect waterproofing material.



This bright cheerful interior above is the eighth floor of the Whitaker Paper Company's building at Baltimore, Md., which comprises the office, sales and display room. The interior is painted with Cemcoat. The concrete floor is smooth and hard—it has been treated with Lapidolith

For years the leading industrial plants of this country—such plants as Ford Motors, Standard Oil, Bethlehem Steel, Swift & Company—have kept down their maintenance costs by using some or all of the above products. It will pay you to know more about these products. Sign the coupon below and return it to us today for complete information.

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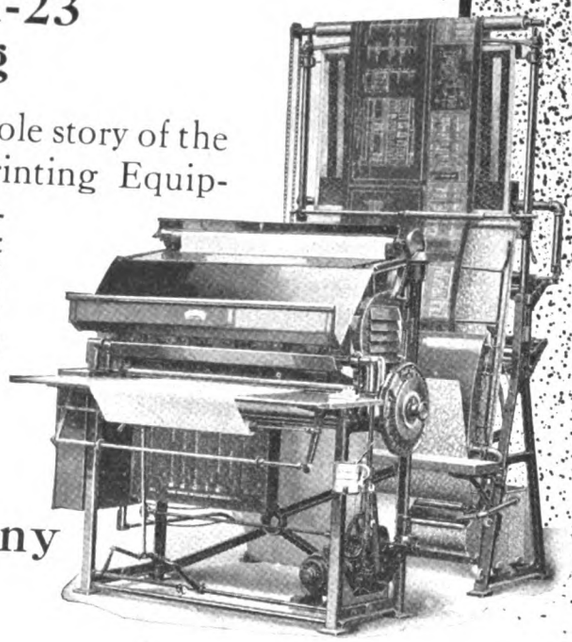
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This blueprint equipment turns out up to 120 linear yards per hour of perfect prints—printed, washed, potashed and dried ready for immediate use. It can be economically operated for as short a run as five to ten yards.

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This catalog tells the whole story of the Peerless Automatic Blue Printing Equipment and illustrates and describes our complete line of Blue Printing Machinery and Accessories. Every drafting room should have a copy—no obligation.

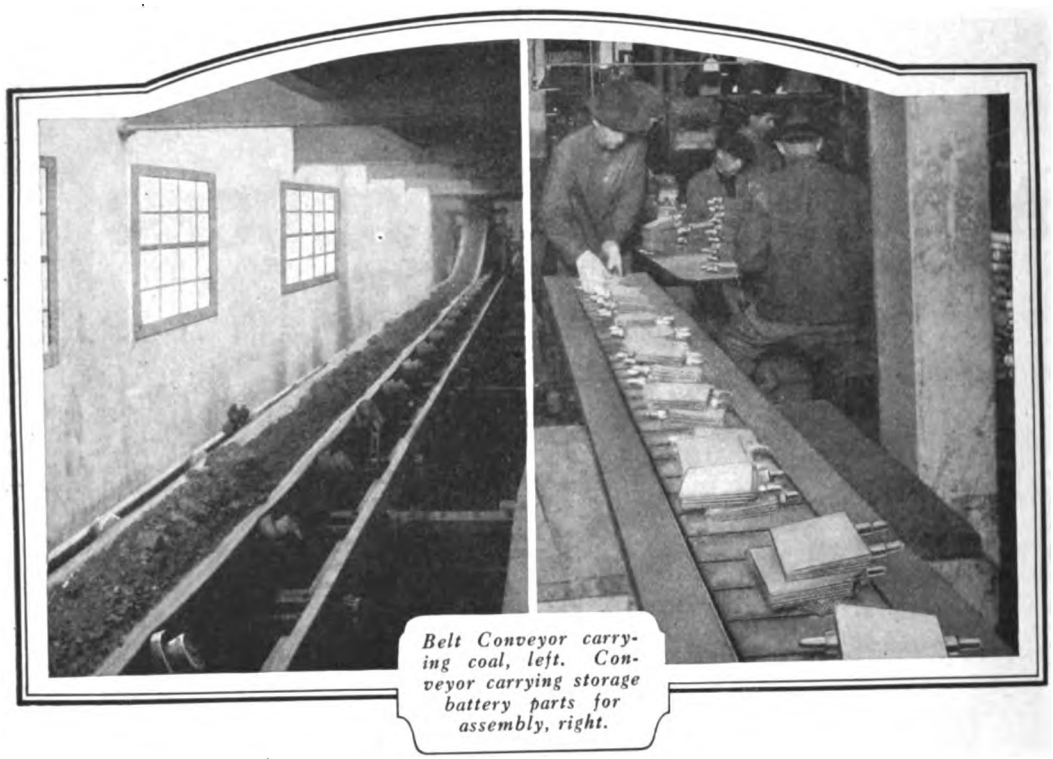


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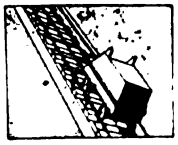
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Belt Conveyor carrying coal, left. Conveyor carrying storage battery parts for assembly, right.



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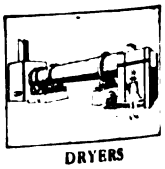
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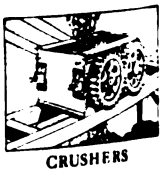
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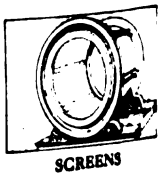
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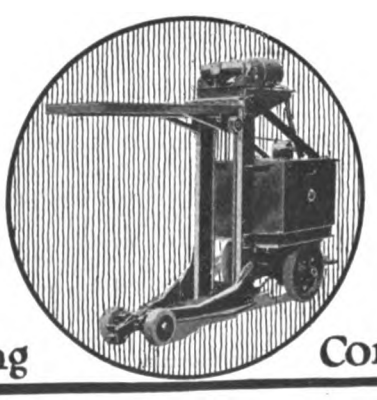
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Sanitary Washbowls



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They are adaptable to small or large space. Their construction offers greatest economy in conserving water. The porcelain enameled bowls—the sturdy cast iron frame—combine sanitation and durability. You can order these bowls in batteries of any number to fit your space. They are easily installed. And they are moderately priced.

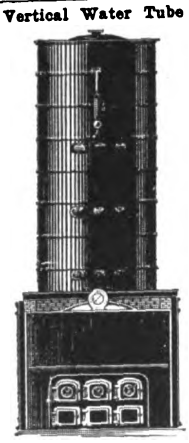
Meeco Individual Washbowls are in 5000 factories representing 200 industries, and this list is growing daily. Why not investigate?

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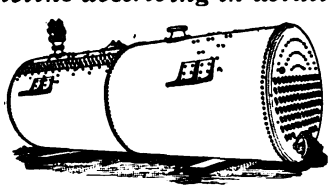
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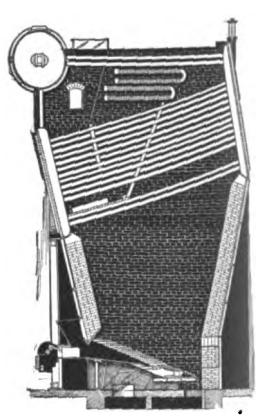


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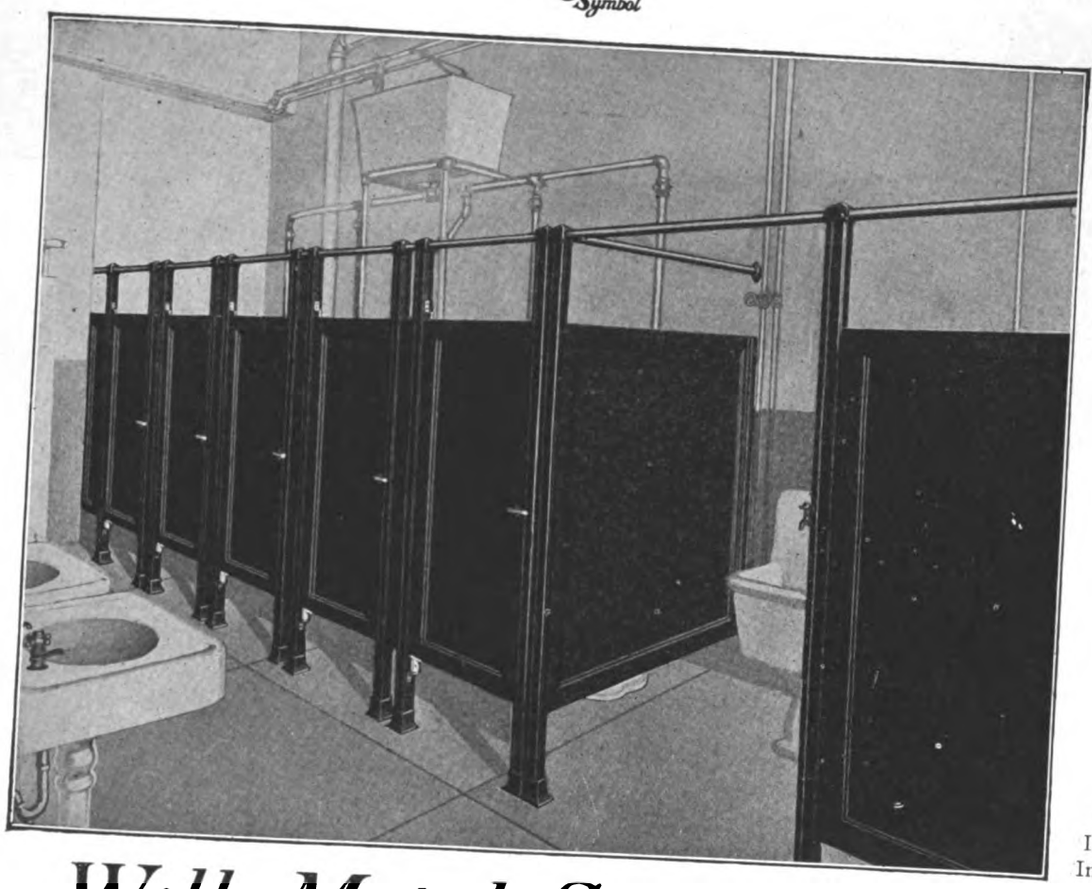
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The Sanymetal Symbol



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Will Metal Stand Up?

THERE are few more rigorous tests for the value of a metal toilet partition than the service-conditions in the average industrial building. Constant heavy use, and even abuse, will soon take the measure of your toilet compartments. The answer is—durability, or rack-and-ruin. The successful manner in which Sanymetal has, for many years, withstood these conditions is a true index of its merit. *It battles deterioration to a standstill.*

Sanymetal's combination of strength, sanitation, and economy has made it "standard specification" for many industrial plants.

Sanymetal products are: Partitions for toilets, showers, dressing rooms, urinals. Partitions for offices and factories. Metal doors, screens and wainscot. Sanymetal Gravity Roller Hinges for toilet doors. Write for latest Bulletins.

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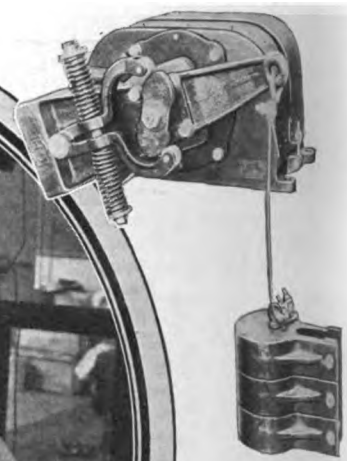
Toilet and Office Partitions

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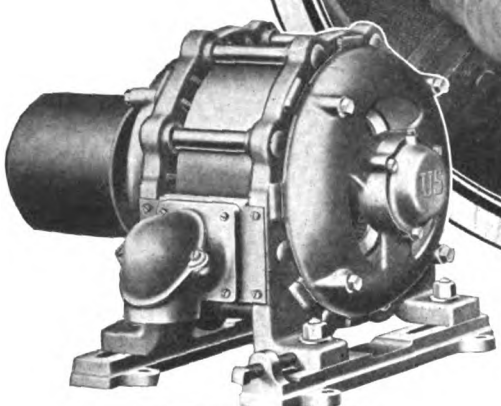
A Page of New Electrical Apparatus

At the right is illustrated a flexible shaft driven commutator undercutter which is used for reconditioning the commutators of worn armatures. It is made by the Martindale Electric Co., of Cleveland, Ohio.

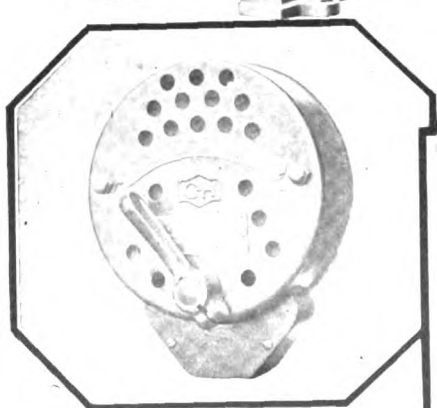




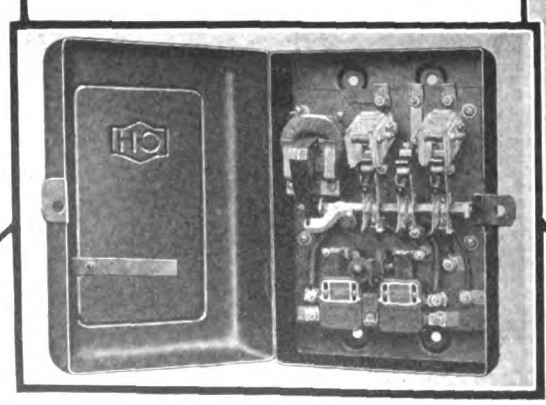
Above is a safety switch for electric cranes. Its purpose is to limit the upward travel of the hook, thus preventing breakage and accident. It is made by the Cutler-Hammer Mfg. Co., of Milwaukee, Wis.



At the left is a new automatic-starting electric motor. It is of the "squirrel cage" type and is brought to speed through inductive action. It is manufactured by the U. S. Electrical Mfg. Co., of Los Angeles, Calif.



The Cutler-Hammer Mfg. Co., has recently bought out this inclosed speed regulator for regulating the speed of direct current motors of from one-twentieth to one-sixth horsepower. It also has other purposes, such as a dimmer for small lighting circuits, etc.

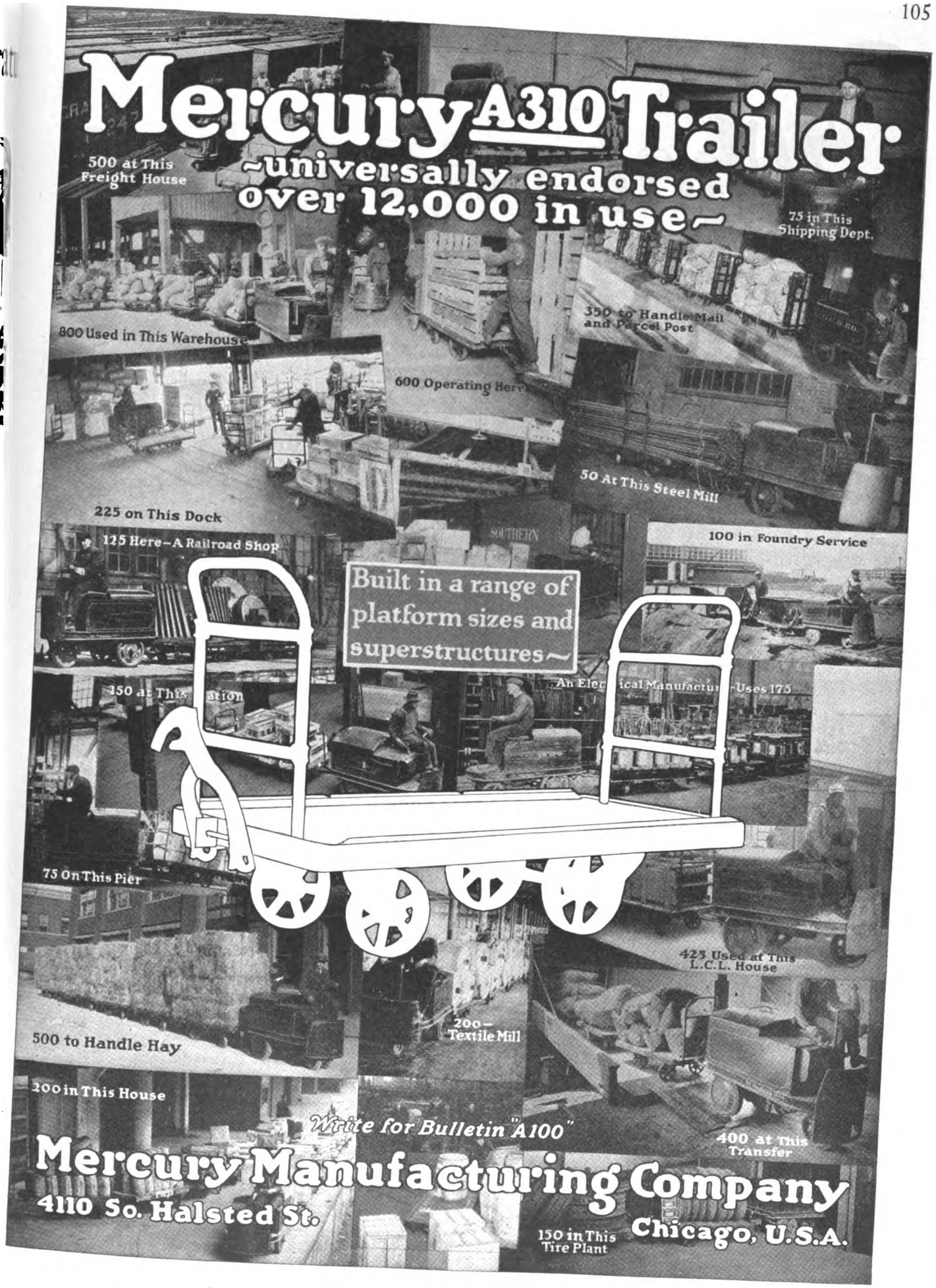


This is an interior view of the new Cutler-Hammer Automatic Across-the-Line Starter. It is designed for squirrel-cage and single-phase motors, and can be operated by push buttons.



Here is a new manually operated oil motor-starter for either two or three phase motors not exceeding five horsepower. It is made by the Condit Electrical Mfg. Co., of Boston, Mass.

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

Bulletins Describing Fan Blower Motors and other motor drives are offered by Diehl Manufacturing Co., page 35.

Six Different Bulletins on Stoker Operation can be obtained from the Detroit Stoker Company. See page 117.

A Paint Made Expressly for Galvanized Iron is described on page 20, by Goheen Corp.

Steel Boxes and Platforms as a part of a materials conveying system is illustrated and described in a catalog issued by the Truscon Steel Company. See coupon, page 3.

The Booklet, "Getting the Drop on Competition," contains some valuable information on saving time and increasing production. See page 6. McCaskey Register Co.

Catalog on Metal Buildings. See page 9, Maryland Metal Building Co.

Leaflet 3907-B Describes a Westinghouse Turbine Installation for boiler feed, fire pumps, service pumps, etc. See page 116. Westinghouse Electric & Mfg. Co.

The Advantages of Co-ordination of Parts, Motors and other Accessories for cranes is proven on page 111, Harnischfeger Corp.

The Solution to the Conveying, Elevating and Power Transmission Problems described in illustrated catalogs is offered by the Link-Belt Company. See page 119.

The Advantages of Proper Electric Starters, Speed Regulators are described on page 109 by the Cutler-Hammer Manufacturing Co. A Consulting Service is offered to industrial executives.

The Waste in Industry Through Dripping Oil from plain bearings is very interestingly described on page 4, by the Skayef Ball Bearing Company. Certified reports can be obtained on some of these investigations.

Illustrated Bulletin No. 29 shows a complete description of the Jennings Pump, its design, construction and method of operation. Page 10. The Nash Engineering Co.

Complete Data on the Venturafin Heating Methods can be obtained from American Blower Company. See page 107.

Coatings that Cut Down Upkeep on Roof, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 97.

The Economy of Using Gas for Process Work and Heat Requirements is described on page 106. Smith Gas Engineering Co.

The Five Points of the Superior Construction of the Parker Vise is shown on Inside Back Cover, by the Charles Parker Company. The small model useful for desk or files is offered.

An Interesting Booklet, "Safeguarding Industry's Greatest Asset: Man," explains an important means of accident prevention. See page 47. Industrial Gloves Corp.

Catalog and Price Lists on Steam Unions that prevent loss of steam can be obtained from the E. M. Dart Mfg. Company. See page 44.

An Automatic Conveyor for Every Purpose. See page 36, Chicago Automatic Conveyor Co. An illustrated catalog can be obtained.

Overhead Cranes and Hoists. See page 32, Maris Brothers, Inc.

Catalog L-44 Describes the Reeves Variable Speed Transmission, which is now Alemite Equipped. See page 44. Reeves Pulley Co.

A Choice of 7 Bulletins on the various types of electric hoists and cranes is offered by Shepard Electric Crane & Hoist Co. See Back Cover.

Nielsen Survey No. 20 describes the savings effected by the Hauck Venturi Low Pressure Oil Burners. See page 32. Hauck Manufacturing Co.

Regulation of Boiler Feed Water is described by the Chaplin-Fulton Manufacturing Co., page 75.

Counting Machine Operations Automatically has been a decided aid in speeding up production. Durant Mfg. Co. offer a 30-day trial on their speedometer. See page 88.

A Metal Cased Broom specially made for heavy duty industrial use is manufactured by The Joseph Lay Co. See page 32.

Five Very Interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 102.

A New Booklet on Blue Printing describes a machine that prints, washes and dries all in one operation. See page 99. The C. F. Pease Company.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see page 89, Wisconsin Electric Co.

Bulletin 38 describes the bearing assembly of the Century Type SC Motor, the motor especially adapted to materials handling machinery. See page 96. Century Electric Company.

Reducing Your Glove Costs 50%. See page 81. The Spartan Glove Co.

A Diagram Book Illustrating the Methods for Saving Space with the use of racks and lifters is offered by Economy Engineering Company. See page 50.

Blue Printing in Four Minutes is described by the Paragon Machine Company. See page 81.

Information on Sanitary Drinking Fountains, together with prices and specifications, can be obtained from Rundle-Spence Mfg. Co. See page 44.

Bulletins Describing Locomotive Cranes in sizes from 10 to 50 ton capacities, suitable for handling heavy materials from pig iron and scrap to pulp wood and other products, should prove of interest to every industrial executive. Can be had by writing The McMyler-Interstate Company. See page 63.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 57.

A Folder, "Choosing the Locomotive for the Industrial Plant," can be obtained from Davenport Locomotive Works. See page 76.

A Special Approval Offer of a Factory Siren is given by The Sterling Siren Fire Alarm Co., Inc., page 90.

Important Information on the Design of Fuses is given in booklet No. 101, issued by the Chicago Fuse Manufacturing Co., page 83.

The Aid Given to Manufacturers in the Use of Fractional H.P. Motors is described on page 2. Wisconsin Electric Co.

A New Idea in Trucking Wheels for industry. See page 93. The Bassick Company. A booklet and a free sample of the new wheel is offered.

The Value of Good Lighting in Industry is shown on page 60 by the Industrial Lighting Committee of the National Electric Light Association.

An Efficient Method of Handling Dies is described on page 52. The Yale & Towne Manufacturing Co.

Jenkins Bros. Feature Their Line of Valves in use by many hotels, hospitals, industrial plants and public buildings everywhere. See page 54.

Complete Details and Prices of All Steel Fabricated Buildings can be obtained from Blaw-Knox Company. See page 34.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move is offered by The American Kron Scale Co. See page 98.

Details on the Super-Hoist, an unusual chain hoist with many exclusive features, is shown on page 79. Wright Mfg. Co.

Coal Handling Economy, possible whether handling five or five hundred tons, is shown on page 46 by Gifford-Wood Company.

A Complete Catalog on the I-Beam Overhead System of handling is offered by The Cleveland Crane & Engineering Company. Page 113. They are also manufacturers of cranes in all capacities.

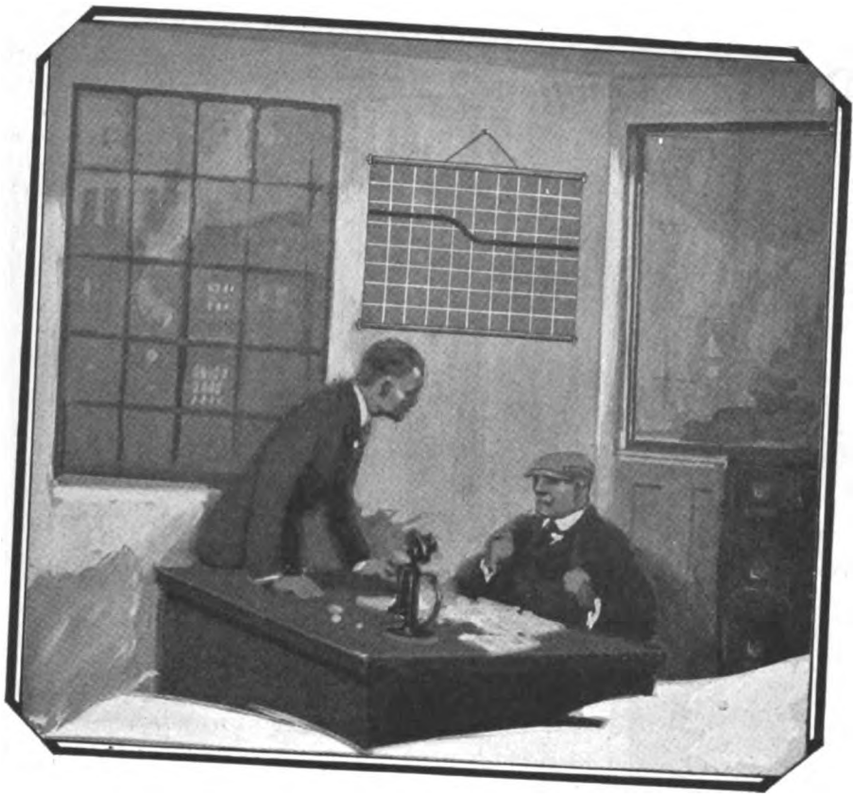
Catalog on a Powerful Small Engine for fans, blowers, stokers, etc., can be obtained from Troy Engine & Machine Company. See page 66.

A 120-Page Catalog on the choice of adjustable Pipe Hangers. Grinnell Company. Page 30.

Industrial Paint that Cuts Maintenance Costs is shown on page 62. American Asphalt Paint Co.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear

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Cutting Manufacturing Costs

THE proper control of your motor-driven equipment increases the efficiency of every drive—reduces wasted time, saves power, increases output—and thus cuts cost of production.

In the case of machine tools there are types of Cutler-Hammer Controllers that permit the quick selection of effective speeds for every job and part of each job.

Where various parts of the plant or several machines are auxiliary to each other—C-H Control insures proper co-ordination.

Even with the simplest drives—the long life and dependable functioning of Cutler-Hammer Controllers mean low maintenance—while at the same time protecting the motors against damage due to overloading or failure of the power supply.

Through the experience and work of Cutler-Hammer engineers, the satisfactory operation of many kinds of motor-driven machines has been made possible. It will pay you to let these engineers consult with you.

THE CUTLER-HAMMER MFG. CO.

Works: Milwaukee and New York

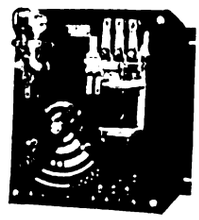
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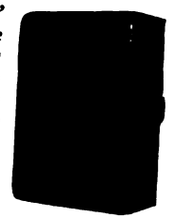
Motor Starters and Speed Regulators

have been used universally for more than a quarter of a century. Regardless of motor type—whether alternating or direct current or the kind of motor-driven machine—there is a C-H Controller to give the most satisfactory service.



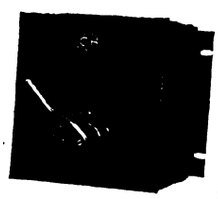
C-H 6425 Automatic Pre-Set Controllers are designed for push button control with speed adjustment feature. Built rugged to withstand severe operating service. Also made completely enclosed.

C-H 9586 new "X" Starters are for the starting of single phase and polyphase motors automatically connecting them directly across the line.

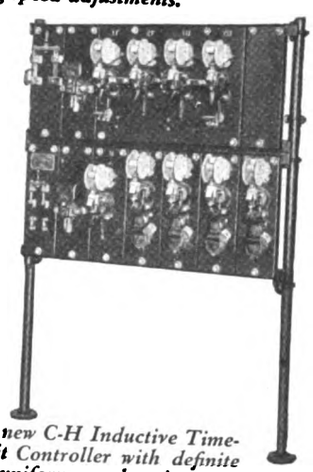




C-H Two Button Switch used with automatic controller for control from remote points.



C-H 2231 Safety Enclosed Manually Operated Starter and Speed Regulator for direct current motors. Widely used with small and average size motors on drives requiring speed adjustments.



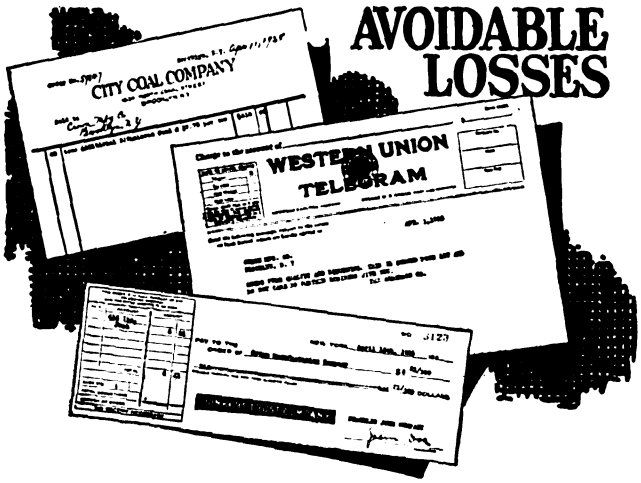
The new C-H Inductive Time-Limit Controller with definite and uniform accelerating periods—a distinctive Cutler-Hammer development. Usual dash pots, relays, interlocks or other moving parts are eliminated. Construction is simple and adjustments for timing readily made. Get Bulletin C-2.

CUTLER-HAMMER

PIONEER MANUFACTURERS OF ELECTRICAL CONTROL APPARATUS

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JUST once, a temperature too low or too high, and you waste many times the cost of installing Motoco Thermometers. Even if variation in temperature does not make it necessary to scrap products, it often damages them so that the products do not come up to your standard, thereby ruining your reputation.

With Motoco Thermometers on the job, there is no excuse for permitting temperature variations—no excuse for using too much heat and wasting fuel.

MOTOCO

INDUSTRIAL THERMOMETER

can be read with ease even 20 feet away. The bold black figures, deep graduations and bright red pointer stand out in clear contrast against the non-glaring white dial.

Simplicity and ruggedness are other points in Motoco's favor. The absence of all delicate and intricate parts means trouble-free thermometer service.



Motoco Industrial Thermometer

Motoco Industrial Thermometers cost no more than high-grade armored mercury-tube thermometers.

Furnished with straight or angle stem, or with flexible tubing up to 50 foot lengths, for all temperatures from minus 40° to plus 750° F.

Our Catalog No. 10 describes Motoco's unique construction in an interesting manner. Send for it.

The MOTO METER CO., Inc.
Industrial Thermometer Division

Manufacturers of Industrial Thermometers and Boyce Moto-Meters Exclusively.

10 Wilbur Avenue
LONG ISLAND CITY, N. Y.



Boyce Moto-Meter

Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 74.

Bulletins on Various Pneumatic Systems in Successful Use are offered by The Dust Recovery and Conveying Co. See page 26.

Illustrated Folder and Prices on steel platforms, boxes, etc., is described on page 90. The Powell Pressed Steel Co.

The Elimination of Production Losses through the use of precision ball bearings and roller bearings is part of the service rendered by the engineers of the Norma-Hoffman Bearings Corp. See page 54.

"Elapsed Time Records," is a booklet containing interesting data on time keeping problems. Free on request. The Calculagraph Co. Page 87.

Hand Book of the U-Re-Lite, book on protection and safe operation of electrical equipment. See page 8. The Cutter Co.

Pulleys and Hangers that stand up under the hardest transmission requirements. See page 49. American Pulley Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co. page 73.

The Low Operating Cost and High Power Factor of the new single-phase motor—type SCR—is described on pages 58 and 59. General Electric Company.

Industrial Truck "Stunts" that Cut Handling Costs are illustrated on page 38. General Electric Co.

The Cleanliness and Economy of Electric Heat and its various uses in industry is shown on pages 84 and 85. General Electric Co.

Complete Protection in Measurement Operations which avoid human errors is shown on page 72. Toledo Scale Company.

The Electric Locomotive for Outdoor Hauling and the service provided by the General Electric Company in this phase of handling is shown on page 68.

Catalog No. 26 Contains a Clear Exposition of Present Day Speed Reduction Practices. See page 64. W. A. Jones Foundry & Machine Co.

Literature Describing Electric Traveling Cranes, Small Hoists, I-Beam Trolley Switches and Turn Tables can be obtained from Roeper Crane & Hoist Works. See page 73.

Industrial Truck and Tractor Bulletin No. 29 contains some pertinent facts on industrial transportation. See page 80. The Baker R & L Company.

A Booklet Entitled, "Saving Slippage and Space," contains facts on the use of short center drive. For a copy see page 65. F. L. Smidth & Co.

High Speed Drills for high speed production. See page 69. The Cleveland Twist Drill Co.

"Mr. Barber's Scrap Book," contains information on the reduction of handling costs. See page 5. Barber-Greene Company.

A Method of Operating Large Doors that Prevents Slamming, Jamming, Sagging and Dragging, is described on page 19. Richard-Wilcox Mfg. Co.

The Economical Utilization of Storage Space is the service offered by Durand Steel Locker Company. See page 71.

A Condensed Handy Catalog and Price List showing the complete line of Chucks and Arbors is now ready for mailing by The Jacobs Manufacturing Co. See page 55.

Roller Bearings on Equipment Used for Heavy Handling and its relation to efficient operation. See page 7. Hyatt Roller Bearing Co.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 88.

Handling-Cost Reducing Cranes are shown on page 30 of Northern Engineering Works.

Form 1874. A booklet on industrial trucking, entitled "Facts for Consideration on Selecting a Battery for Electric Industrial Truck and Tractor Service," is offered by The Electric Storage Battery Co. Page 56.

Sample Band or Hack Saw Blades sent on request. See page 74, The Henry G. Thompson & Son Company.

Keeping Dirt and Dust Out of Electrical Equipment is essential to efficient operation. A descriptive folder giving

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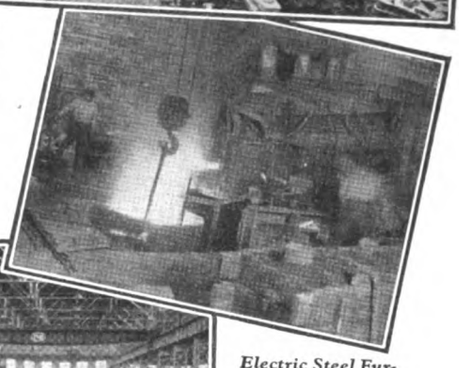
When Quick Delivery and Undivided Responsibility Count



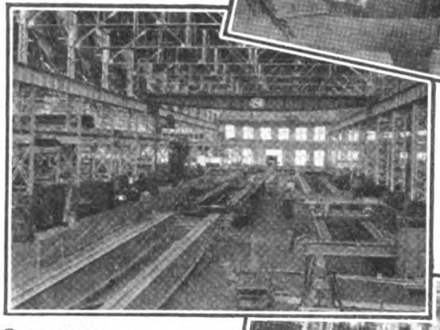
Steel Storage where a large stock of structural shapes and plates is maintained in order to facilitate prompt shipment of P & H Cranes



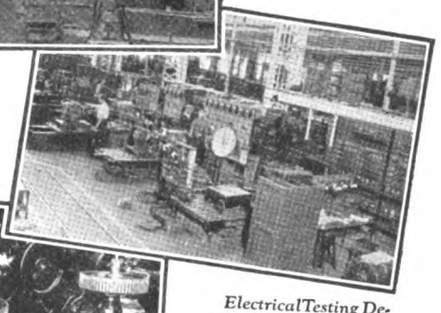
An enormous volume of crane parts stored in the P & H plant helps to make assembly a quick and easy matter.



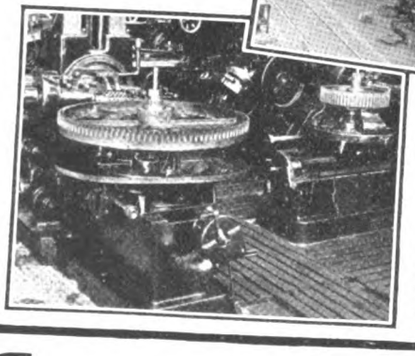
Electric Steel Furnace where castings are produced for P & H products.



One end of roomy assembly floor for P & H cranes.



Electrical Testing Department where all electrical equipment is thoroughly tested.



Gear Cutting Department where all gears are accurately cut and finished.

WHEN you want a traveling crane the delivery date is generally an all-important item. Naturally you need the crane and every day without its service means a repeated loss in both production and operating costs.

Quick delivery after the order is received has always been a source of pride at the P & H plant where a large and complete stock of materials and parts is maintained for quick assembly. Here are a few items which are typical of P & H inventories—

Material	*Inventory*
Structural Steel	4000 Tons
Finished Gears and Pinions	5657
Truck Wheels	1619
Electric Motors	510
Controllers	250

Another important feature of consideration is that P & H traveling cranes are built completely in the P & H shops, equipped with gray iron, steel and brass foundries; structural steel and forge shops; machining and electrical manufacturing departments. There are no delays in getting castings, structural members, electrical equipment, etc.

Further, every P & H crane is produced from start to finish with UNIT RESPONSIBILITY, and every part of the P & H crane coupled with this *undivided responsibility* means unexcelled production and better service on deliveries. Also, greater purchasing power which insures highest quality at lowest cost.

HARNISCHFEGER CORPORATION
Successor to
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CRANE AND HOIST DIVISION
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3850 National Ave., Milwaukee, Wis.

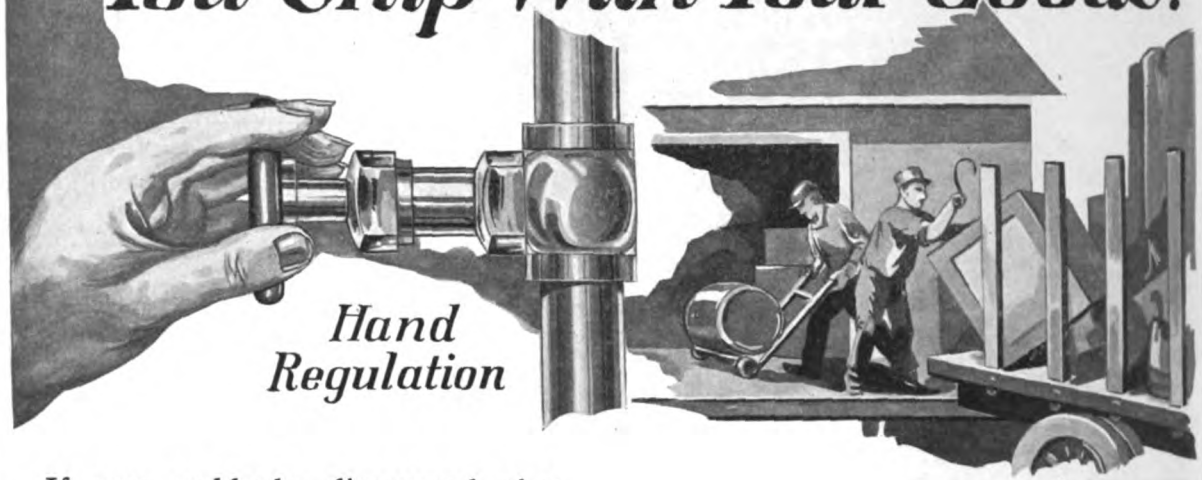
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How Many Dollars Do You Ship With Your Goods?



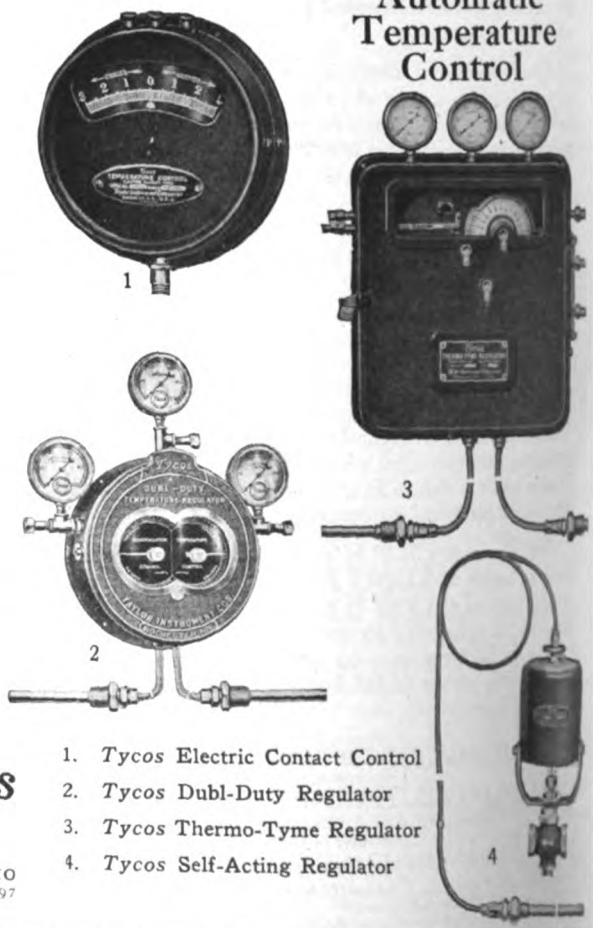
If you suddenly discovered that every time a shipment of your products left the plant your shipping clerk included a package of dollar bills from the cashier's drawer, what would you do?

Don't smile—you may be doing that very thing right now; perhaps not quite so tangibly, but nevertheless, just as effectively. If you are depending upon hand control of heat and pressure regulation, you are shipping away dollar bills, in the form of added costs.

Tycos Indicating, Recording and Controlling Instruments give you the accurate knowledge of temperatures and pressures so necessary if waste and a piling up of overhead are to be avoided. There are many places in every plant where a close and constant check with *Tycos* Automatic Controls will do wonders toward reducing costs.

There's a catalog for you. Write for it *Now*.

Tycos
Automatic
Temperature
Control



1. *Tycos* Electric Contact Control
2. *Tycos* Dubl-Duty Regulator
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Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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CLEVELAND HAND OR ELECTRIC TRAMRAIL

Large windows and more light—because men work in proportion to the ease with which they see. But large windows lose much of their value if a coating of dirt and soot is allowed to reduce their transparency.

Help Your Windows Do Their Job

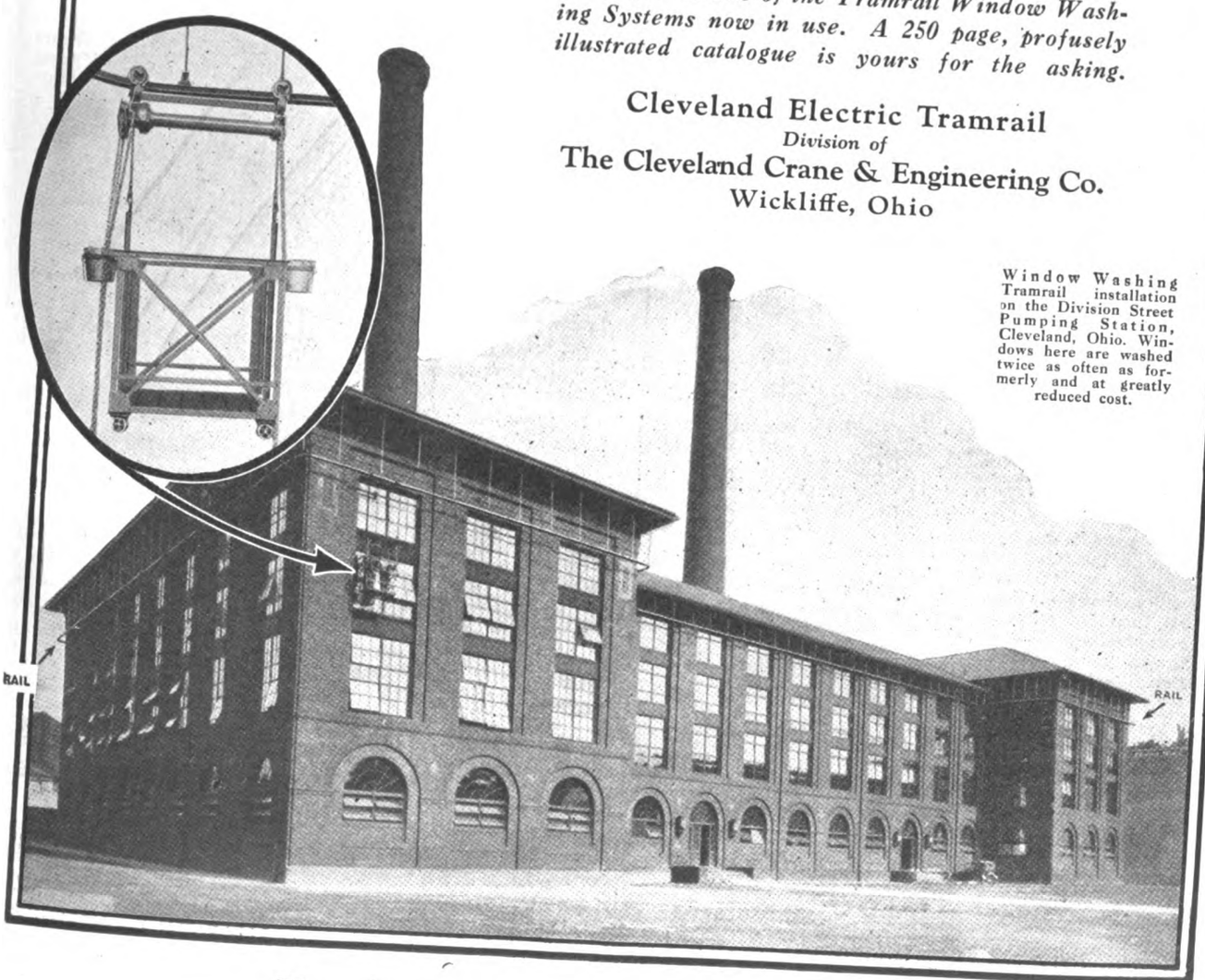
by cleaning them frequently. A Cleveland Tramrail window washing installation will cut the cost of cleaning them in half. The same number of cleaners will make two trips around the building in the time formerly required for one.

Write for details of the Tramrail Window Washing Systems now in use. A 250 page, profusely illustrated catalogue is yours for the asking.

Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

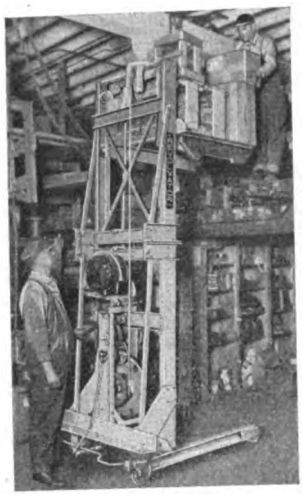
Tramrail Stocks in the Following Cities:

Albany	93 State St.
Boston	44 Bromfield St.
Buffalo	1507 Hertel Ave.
Cincinnati	701 Union Central Bldg.
Chicago	80 E. Jackson Blvd.
Denver	1226 E. 17th Ave.
Detroit	149 E. Larned St.
Indianapolis	Merchants Bank Bldg.
Los Angeles	430 E. Third St.
Louisville	36th and Missouri Sts.
Milwaukee	B'dwy and Michigan St.
New York	30 Church St.
Philadelphia	2401 Chestnut St.
Pittsburgh	412 House Bldg.
San Francisco	16 California St.
St. Louis	1309 Pine St.
St. Paul	432 Endicott Bldg.
Syracuse	406 So. Franklin St.



Window Washing Tramrail installation on the Division Street Pumping Station, Cleveland, Ohio. Windows here are washed twice as often as formerly and at greatly reduced cost.

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Solve Your Storage Problem with a Revolvator

You won't need so much floor space if you pile your goods right up to the ceiling. Get a Revolvator—a hand power or a motor driven or a combination hand and motor operated type and your storing problem will be solved.

All the leading industrial concerns use Revolvators—the General Motors Co. operate 46 Revolvators. If you store goods it will pay you to buy a Revolvator.

Send for Bulletin IND and get the details.

Portable Elevators **Liftrucks** **Barrel Racks**

REVOLVATOR CO.

322 GARFIELD AVE., JERSEY CITY, N. J.

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Worn out from constant use? Borrowed by somebody, and never returned? Or have you just put off the privilege of owning a copy at all?

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It is the great Management Classic which has helped thousands of men to improve their knack of directing men, machines and methods to the most enduring economical advantage. It will be sent to you for your FREE EXAMINATION.

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Send me on ten days' approval one copy of Emerson's "Twelve Principles of Efficiency." If I keep it, I shall remit $3.

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price list of portable electric blowers and testimonials by leading manufacturers is offered by Clements Mfg. Company. See page 82.

Information on Lighting Fixtures, adjustable for any operation is given in the catalog offered by the American Fixture Company. See page 35.

Bulletin No. 130 contains full information on shaft bearings. See inside front cover. Hyatt Roller Bearing Company.

A Belt Lacer, extremely tough, durable, and pliant is shown on pages 40-41, by the Clipper Belt Lacer Company.

Bulletin IND Offers a Solution to the Storage Problem. See page 95. Revolvator Company.

Catalog No. 409G is an Illustrated Book on belt conveyors. It contains many photographs and valuable information on belt conveyor installations. See page 78. The Jeffrey Manufacturing Co.

A Contrasting Picture Showing the Use of Skybryte in an industrial plant is shown on page 75. The Skybryte Company. See free trial offer.

The Special Features of the Hack Saw Blade is described on page 75, by Victor Saw Works, Inc. Sample blades offered free.

End Grain Wood Wheels for Trucks used in industrial handling is described on page 48, by the Metzger Company, Inc.

How 5,000 American Industries Protect Employees Against Infection is told on page 70 by the Cresog Laboratories Co.

General Catalog No. 28 contains the complete line of power saving, transmission equipment, sold by the Pyott Foundry Co. See page 48.

Complete Data on Compressed Air Hoists can be obtained from the Curtis Pneumatic Machinery Company. See page 77.

Eliminating Dust, Filings, Lint, etc., from Workrooms as a means towards industrial efficiency is described on page 80 by Invincible Vacuum Cleaner Manufacturing Co.

Catalogs Describing Shop Forges, Drills, Punches, Shears and Bar-Cutters, Exhausters or Combination Wood-Working Machinery can be had by writing to Buffalo Forge Company. See page 92.

Foot Protection for Workmen, an aid to efficient production. See page 82. F. J. Stahmer Shoe Company.

Over 12,000 of the New Trailers Are Now in Use, this is the A310 made by the Mercury Mfg. Co. See page 105.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 21.

One of the Various Industrial Uses of Dow Conveyors is shown on page 1, by the Logan Co.

Booklets on Automatic Temperature Control of Heat in virtually every industry are offered by the Taylor Instrument Companies. Page 112.

Information on Coal and Ash Handling is offered by the Chain Belt Company. See page 120.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 86.

Catalog No. 8 Describes an Indicating Thermometer useful for various industrial purposes and sold at an exceedingly low price. See page 104. The Motometer Co., Inc.

Catalog and Prices of Sanitary Water Coolers and Bubblers. See page 102. Manufacturers Equipment & Engineering Co.

"Coal—the Basic Fuel" shows how your local or nearest mined fuel can be economically burned. See page 115. Stoker Manufacturers Association.

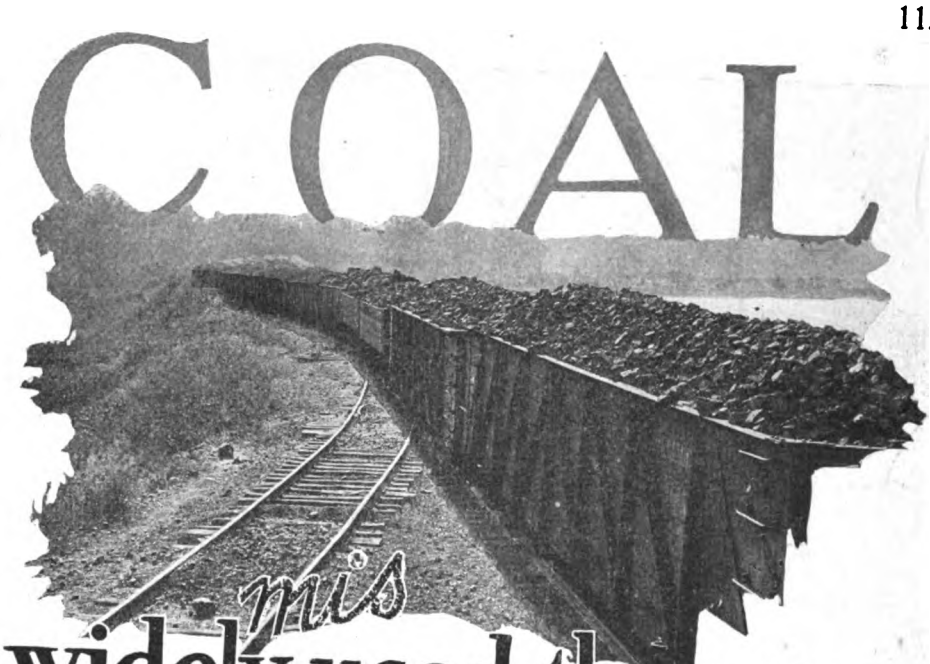
The New K Model Lift Truck with its 7 distinctive features is shown on page 94 by The Stuebing Truck Company.

The New 1925 Catalog containing 40 pages of interesting data on electric lift trucks and profusely illustrated is now ready for mailing by The Elwell-Parker Electric Co. See page 42.

The World's Market Place for Industrial Equipment is a description given to the Dodge Service to Industry. See page 24. Dodge Manufacturing Corp.

A Steam Trap on 30 Days' Free Trial. Also booklet R-268 which describes the new number 9 Sarco Steam Trap. See page 28. Sarco Company, Inc.

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~more widely used than any other raw material

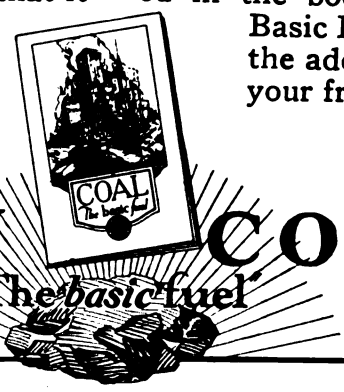
WITH the exception of coal, every material used in manufacturing is carefully bought, carefully checked and carefully used. Coal, it seems, is largely taken for granted. As a result, the most widely used of all raw materials is probably the most misused!

This is simply a tradition carried over from the time when the cost of coal was negligible—but consider this:

While coal is still the cheapest fuel for most uses, it is a manufacturing item of such staggering proportion that it is deserving of far more thought than the thousands of other materials which are the subject of hairsplitting cost records.

Acting upon this fact, thousands of manufacturers have installed mechanical stokers. And by so doing they have effected greater savings in production cost than can be made by any other equipment representing a comparable investment.

These manufacturers will tell you that the correct firing of coal is the greatest step in reducing production costs. The facts are clearly presented in the book, "Coal—the Basic Fuel." Write to the address below for your free copy.



BURN COAL

"The basic fuel"

STOKER MANUFACTURERS ASSOCIATION

W. V. McAllister, Secretary, Foot of Walker Street, Detroit

STOKER MANUFACTURERS ASSOCIATION

Ten cars of coal—or nine?

Mechanical stokers save coal by increasing furnace efficiency. They also make it possible to burn cheaper grades and sizes of local coal. Ten per cent saving is a conservative estimate

Five men or

Stoker firing will cross at least two men off the pay roll if adopted by a hand fired plant now requiring five men. The better working conditions appeal to a better, steadier class of men.

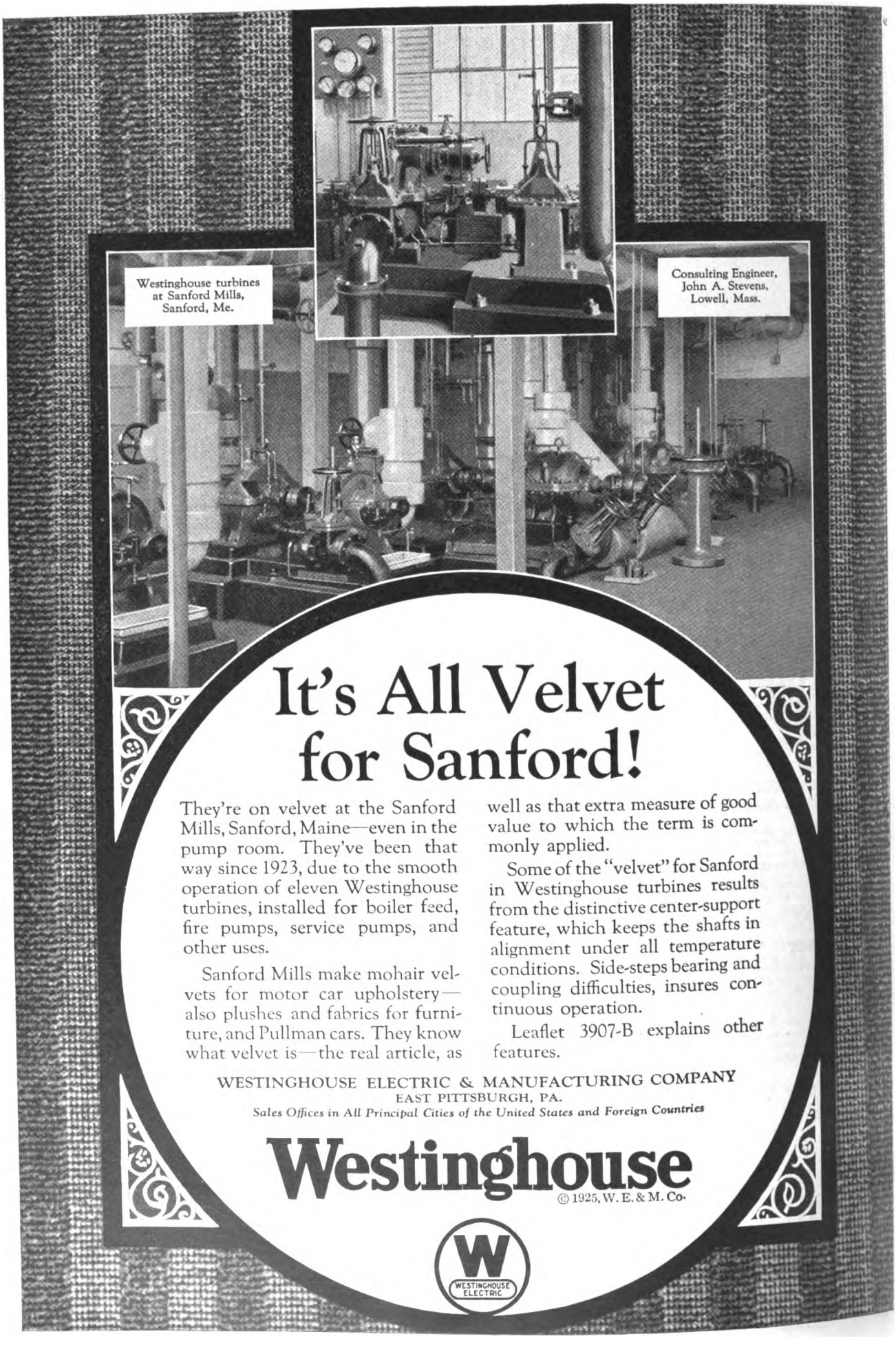
Four boilers or three?

Greater steam demands can be met without adding to your present boiler equipment. Three boilers can be made to do the work of four through the higher combustion rate made possible by—

STOKER FIRING

I.I.9—M-RTG

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It's All Velvet for Sanford!

They're on velvet at the Sanford Mills, Sanford, Maine—even in the pump room. They've been that way since 1923, due to the smooth operation of eleven Westinghouse turbines, installed for boiler feed, fire pumps, service pumps, and other uses.

Sanford Mills make mohair velvets for motor car upholstery—also plushes and fabrics for furniture, and Pullman cars. They know what velvet is—the real article, as well as that extra measure of good value to which the term is commonly applied.

Some of the "velvet" for Sanford in Westinghouse turbines results from the distinctive center-support feature, which keeps the shafts in alignment under all temperature conditions. Side-steps bearing and coupling difficulties, insures continuous operation.

Leaflet 3907-B explains other features.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.
Sales Offices in All Principal Cities of the United States and Foreign Countries

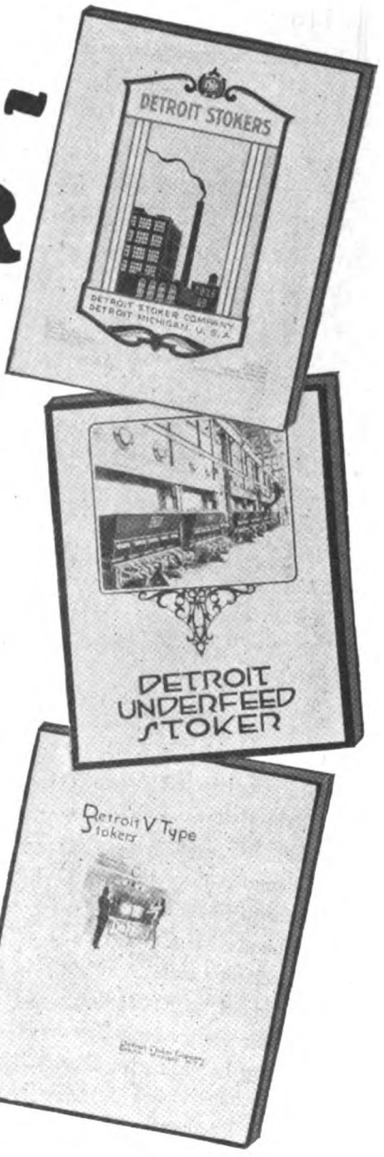
Westinghouse

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W
WESTINGHOUSE ELECTRIC

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for every service - a DETROIT STOKER



FROM the largest installation to the smallest there is a size and type of Detroit Stoker for every purpose. Detroit Stokers burn the widest possible range of fuels. They are in successful use under all types of boilers, large and small. They win by comparison everywhere on the basis of high operating efficiency and low maintenance costs.

Which Catalog Do You Want?

(Underfeeds)

Detroit Multiple Retort, for large boilers and high ratings.
Detroit Double Retort for medium installations.
Detroit Single Retort for boilers up to 300 H. P.
Detroit Single Retort Twin Setting for wide furnaces.
Detroit Industrial Stoker for firing all types of Industrial Furnaces.

(Overfeed)

Detroit "V" Type, natural draft for boilers from 50 to 500 H. P.

It's the level fuel-bed!



The LEVEL FUEL BED is an outstanding feature of Detroit Multiple Retort Underfeed Stokers. Every movement of the fuel is mechanical and UNDER CONTROL. Gravity is eliminated, there is no avalanching. The flow of fuel in each retort may be retarded or speeded up independent of other retorts. Preventable loss of combustible in the ash is eliminated.

DETROIT STOKER COMPANY
829 General Motors Building Detroit, Michigan

DETROIT STOKERS

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A

American Asphalt Paint Co. 62
American Blower Co. 107
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American Kron Scale Co. 98
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B

Baker R & L Co. 86
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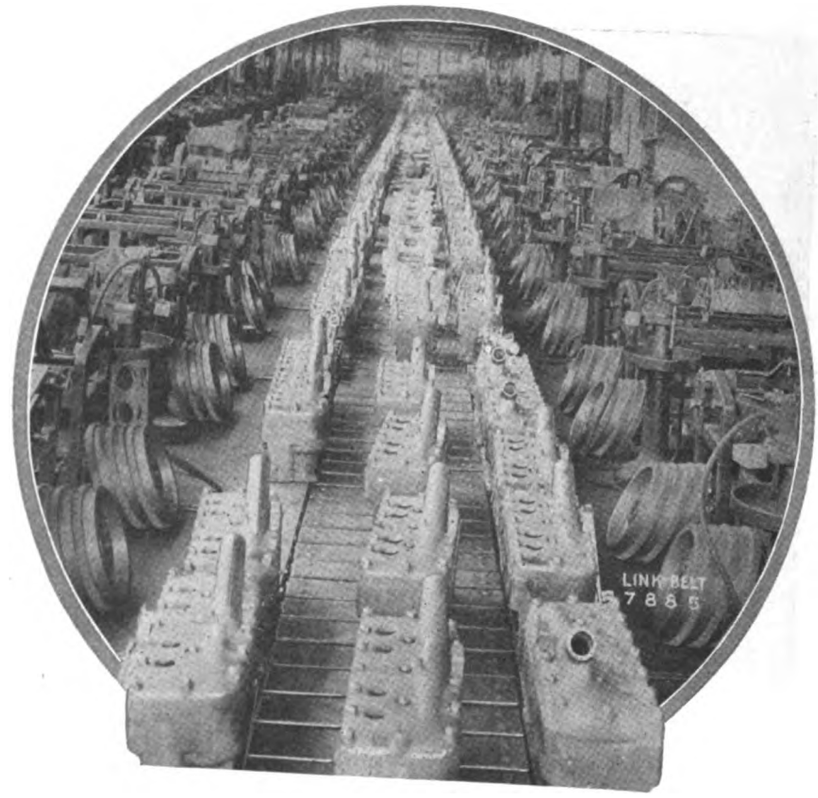
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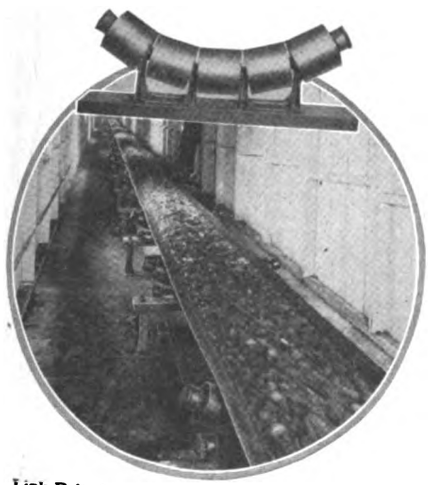
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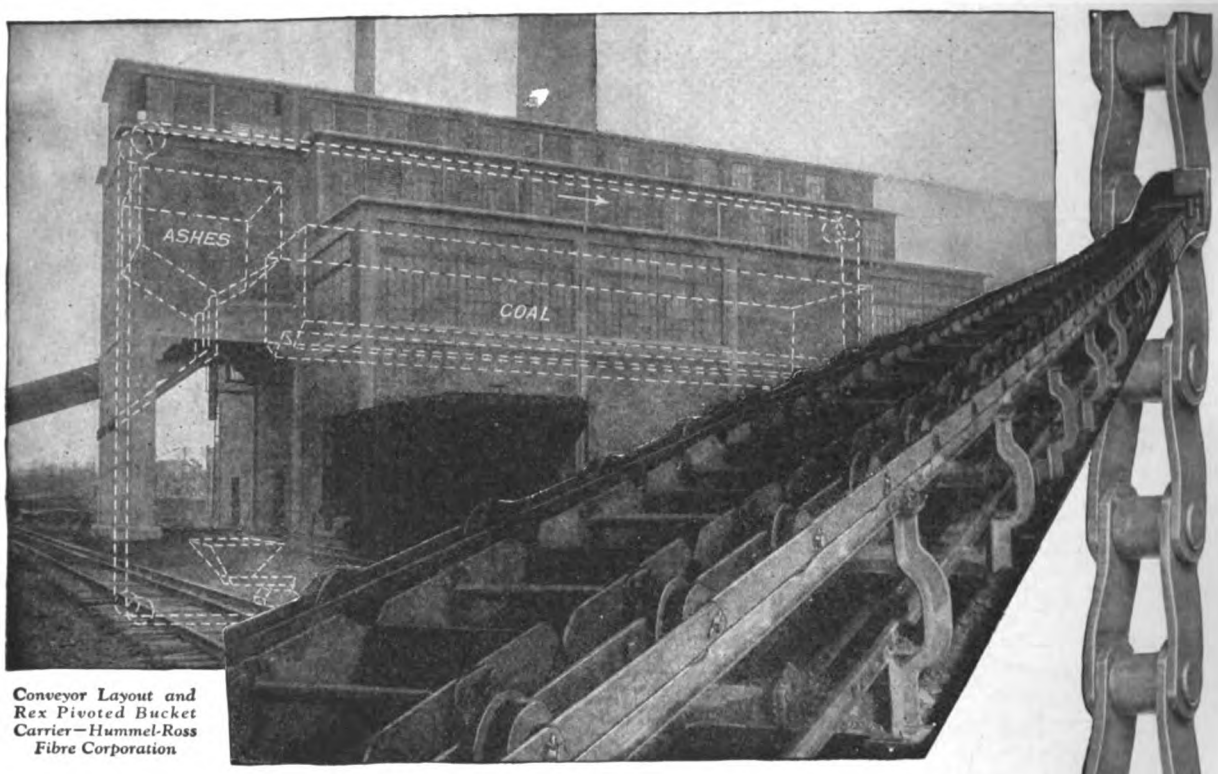
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Rex Pivoted Bucket Systems are often laid out as shown above to handle coal in and ashes out.

Pivoted Bucket Carriers are but one of the many types of *economical* and *durable* coal and ash handling machinery built by the Chain Belt Company.

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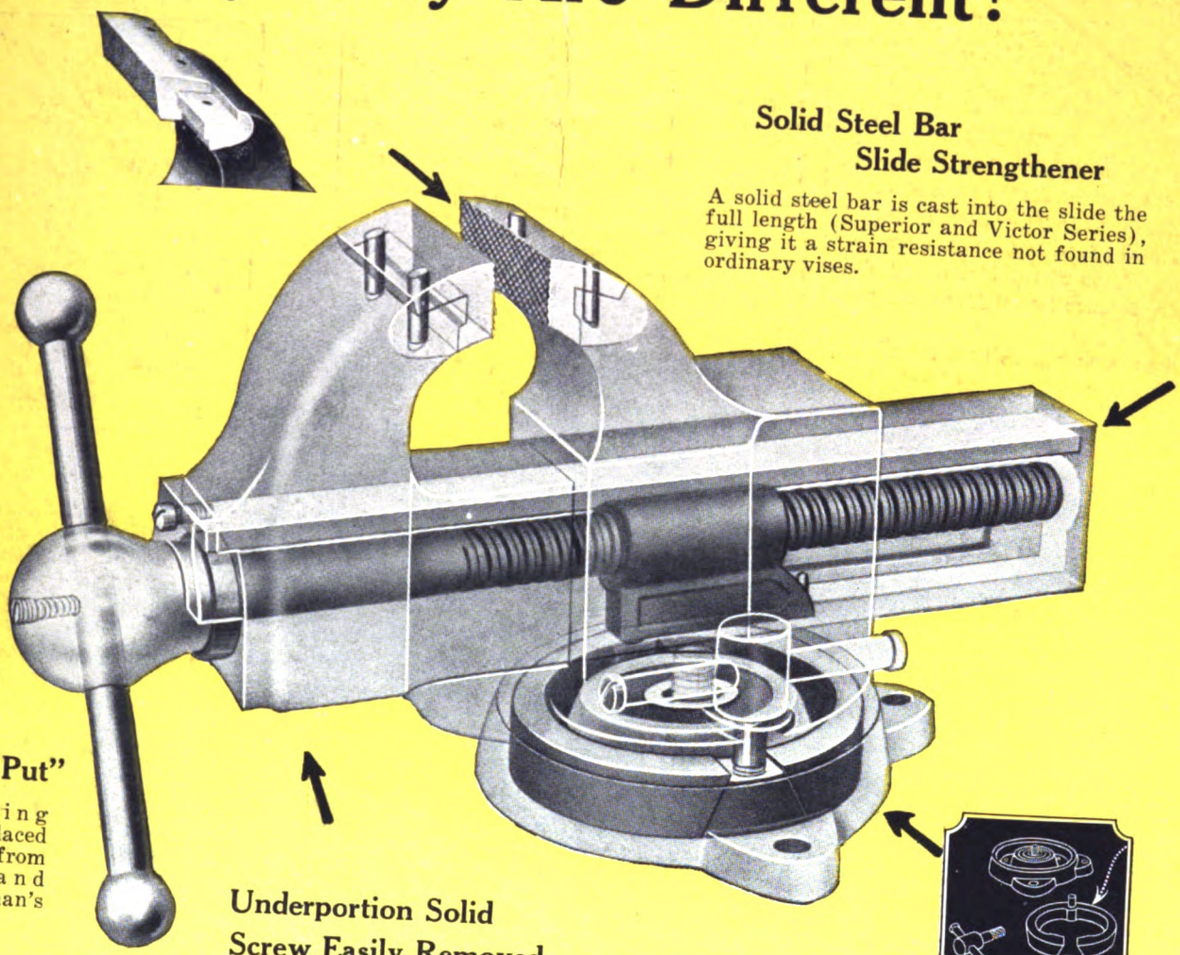
e the careful ng and fitting in the jaw truction. The s are *pinned* and *cannot* e *loose*, but removable if ssary. This been a Parker ure for 84 s.

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TREND OF LABOR AWAY FROM U. S.

Workers Going Out Exceed Incomers by 16,842.

DECLINE IN OTHER CLASSES

Total Immigration Decreased 71.4 P. C. in Last Ten Months.

The trend of labor has been away from the United States instead of toward it since the 2 per cent. quota law went into effect last July, according to an analysis of the National Industrial Conference Board just made public.

The analysis shows that from July, 1924, to April, 1925, there were 27,908 common laborers admitted, as compared with 97,886 during the corresponding period of the year before. This decrease becomes an actual deficit when the figures in regard to those leaving the country are considered. The figures for the period from July, 1924, to April, 1925, show that 44,750 laborers left the country. This makes a deficit of 16,842 for the ten months since the operation of the new immigration law.

Total Immigration.

A decrease of 71.4 per cent. is shown in net immigration of all classes from last July to April, as compared with the figures for the corresponding period a year before. During the ten months under the new quota law, a total of 242,965 persons were admitted, as against 637,602 during the corresponding period the year before.

Departures from last July to April totaled 78,578, as compared with 63,824 from July, 1923, to April, 1924. The net immigration total during the last ten months was 164,387 as compared with 574,274 during the corresponding ten months prior to the new quota law.

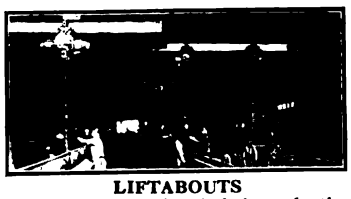
Effect on Wages.

"While the ultimate effect of the new quota law at this time cannot be determined, the report states, "the scaling down of immigration to about a fifth of what it was before the war has the immediate effect of stabilizing the growth of our population, with the attending result of a sustained high wage level. Actual money wages in industry to-day are 116 per cent. above what they were before the war.

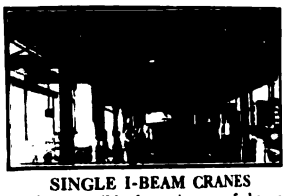
"Allowing for the decline in the purchasing power of the dollar, and assuming that the same standard of living prevailed as existed in 1914, the wage earner to-day is about 30 per cent. better off, as regards 'real' wages than he was at the peak of the wage level of 1920."

one reason why so much Shepard equipment is used

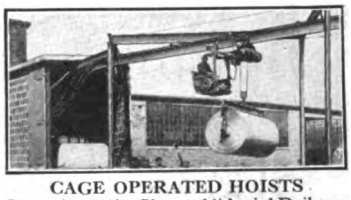
Please read the accompanying article from the New York Sun, June 22, 1925. It gives the facts about the Labor Situation. *Our influx of common labor is 1/5 of the pre-war supply—actual money wages in industry are 116 per cent higher.* It is a problem that thousands of business executives have solved by consigning their handling to Shepard Electric Hoists, Cranes and allied equipment.



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¼, ½, and 1 ton electric hoists—do the work of two to a dozen men.



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Make accessible the entire area of a bay or balcony. Lifting facilities at every point.



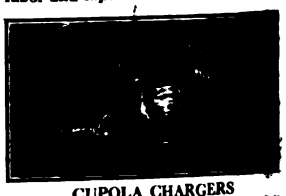
CAGE OPERATED HOISTS
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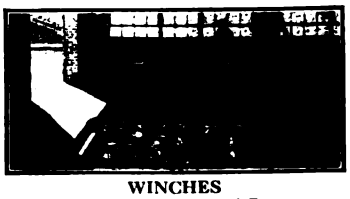
HOISTS TO 10 TONS
There are 33 distinct types of Shepard Floor Operated Hoists—each to save labor and expedite handling.



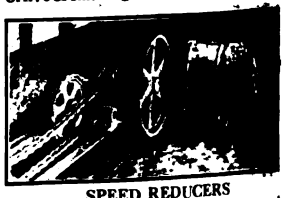
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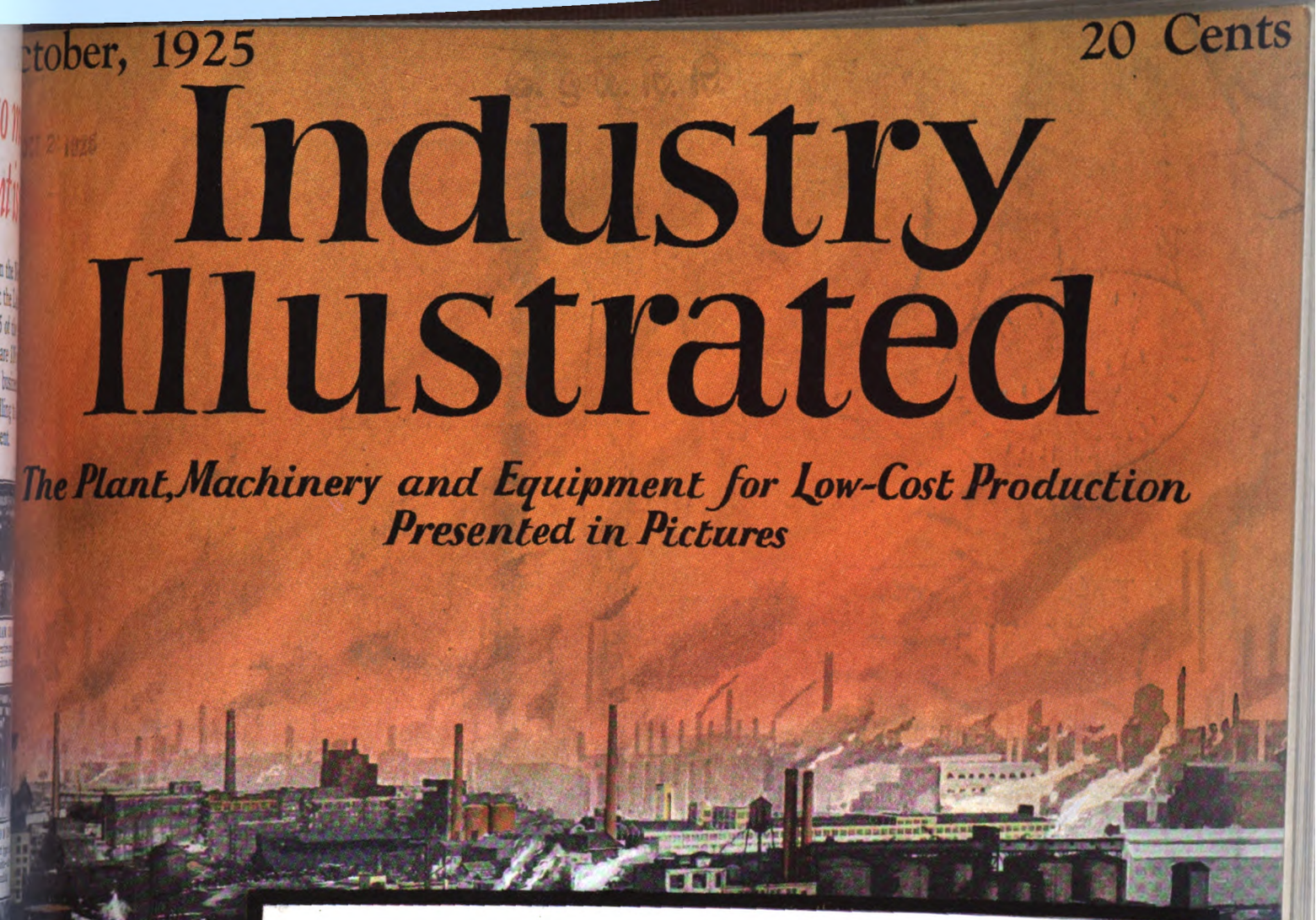
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The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



Consider the Factory Work Bench

Realizing how great a proportion of your plant's production is handled, at various stages in process, on the work bench, how much thought is given to the bench itself? In all too many cases, the work bench consists of a couple of planks, nailed onto more-or-less secure legs, at whatever height seems convenient.

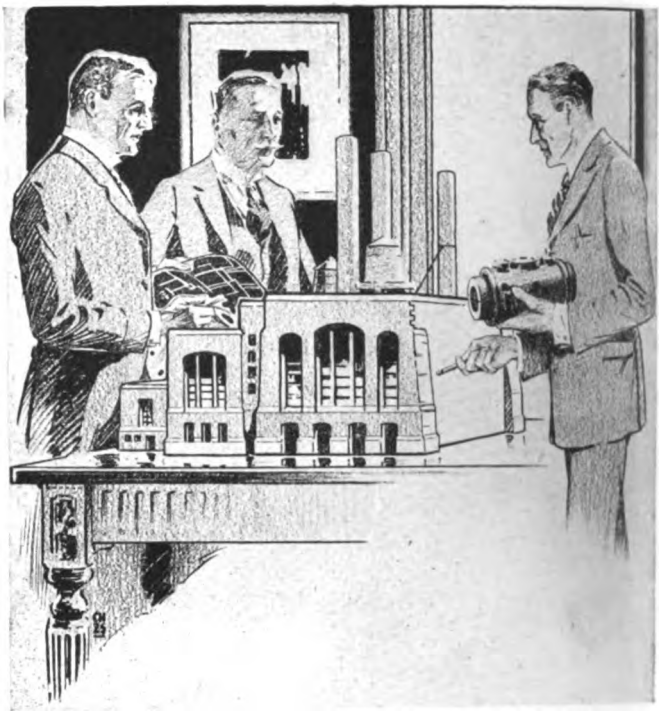
Turn to page 12 for some illuminating ideas on this subject.

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HYATT ROLLER BEARINGS FOR LINE SHAFTING

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JACK FROST Sugar—economical, dependable. Only through highly specialized, efficient and economical methods is it possible for the manufacturers to live up to the reputation established for Jack Frost Sugar. From cane to carton every step in the process of refining is planned to give to exacting customers of today the finest product at minimum cost. It is more than a coincidence that the National Sugar Refining Company should have selected Dow Conveyors, also economical and dependable, to cut costs of manufacture and expedite production to fill a growing demand. It is difficult to imagine any industry in which Dow Conveyers cannot perform the same essential functions. Ask our nearest office.



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Formerly THE DOW CO., *Louisville, Ky.*

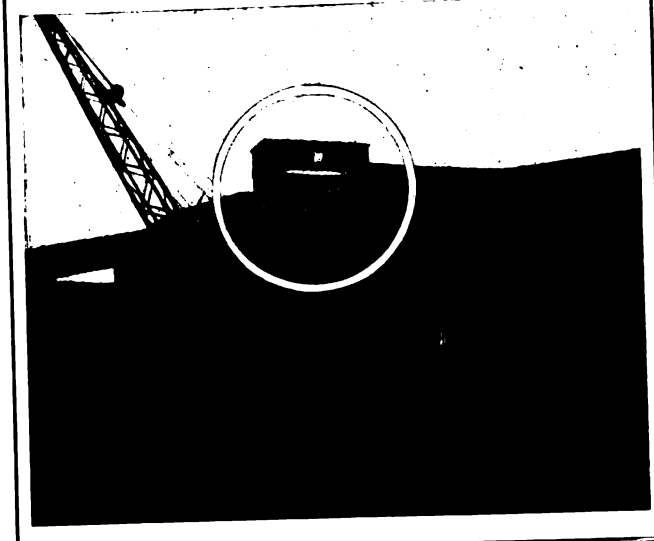
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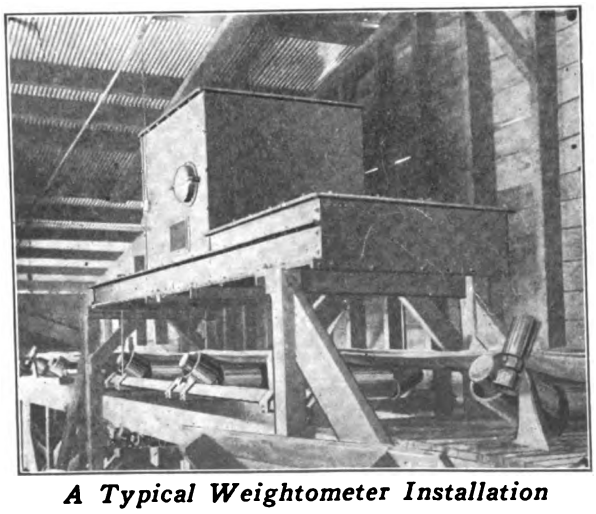
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A Typical Weightometer Installation

The Publisher's Column

Take Inventory of Ideas

HOW many new ideas have you got in your cupboard? This is a personal question, but one that you may profitably ask of any man in a responsible position in industry from foreman to general manager.

It is a vital question to ask, too, because some people, very smart and able otherwise, tend to get into a rut and to think that present ways of doing things are about as good as they should be.

One very successful industrial executive makes a practice of requiring his subordinate executives to submit to him twice a year an inventory of new ideas.

Do you get the point?

Knowing that he will be called upon to submit such a report every foreman or department head is going to keep his eyes, ears and mind wide open so that he can have something to report for the new idea inventory.

Thus this question is not merely for informational purposes, but is really a stimulant to progressive thinking.

Don't forget that there are many new and valuable ideas lurking in the pages —editorial and advertising alike—of every worth-while business, trade, and technical periodical.

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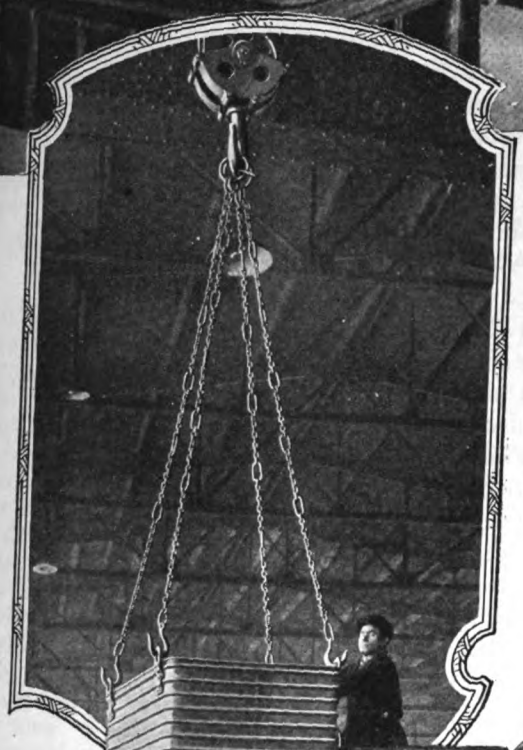
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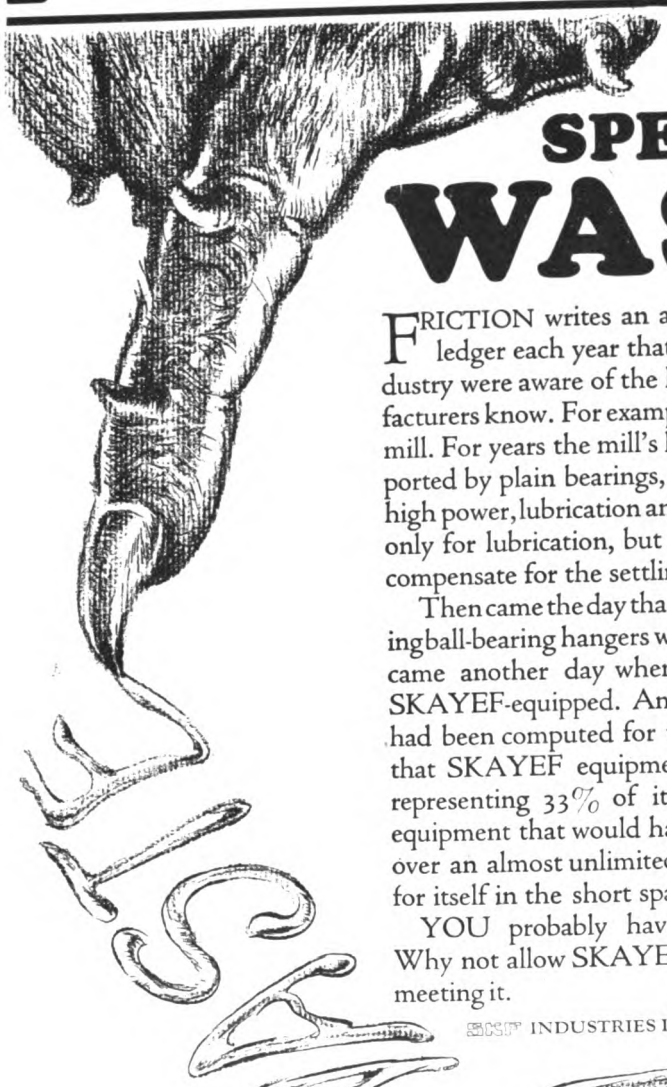
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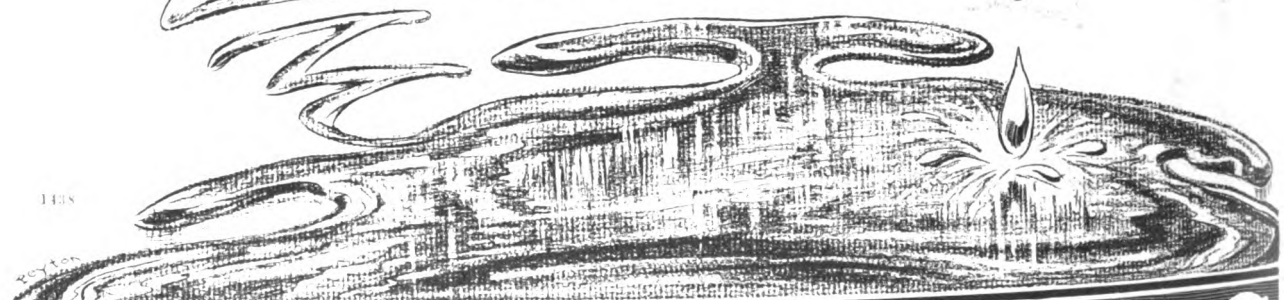
FRICTION writes an annual loss on industry's ledger each year that would be appalling if industry were aware of the loss. But only a few manufacturers know. For example, a large North Carolina mill. For years the mill's line shafting had been supported by plain bearings, with the usual result,—high power, lubrication and labor costs, the latter not only for lubrication, but for lining up shafting to compensate for the settling of the building.

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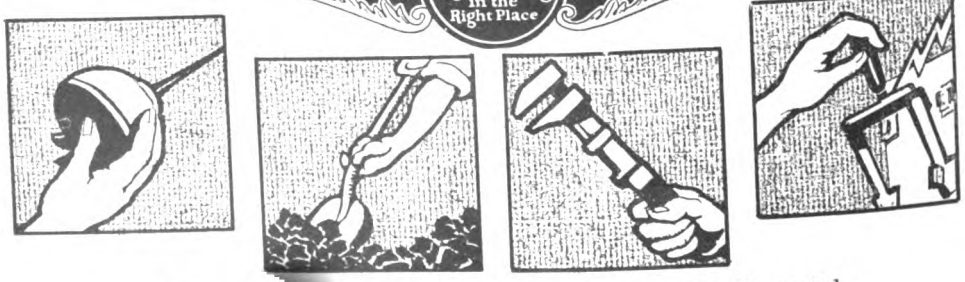
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Then 1925 came along. A highly competitive market sent selling cost sky high. And the fellows who ran the plant couldn't drive production cost down far enough to meet this rise. They couldn't show a profit.

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Perhaps no one would have ever noticed that yard gang if the head of the assembling department hadn't come to the plant one morning with a grouch on. He had a right to be grouchy, too. Three men had just been taken out of his department to lower assembling costs.

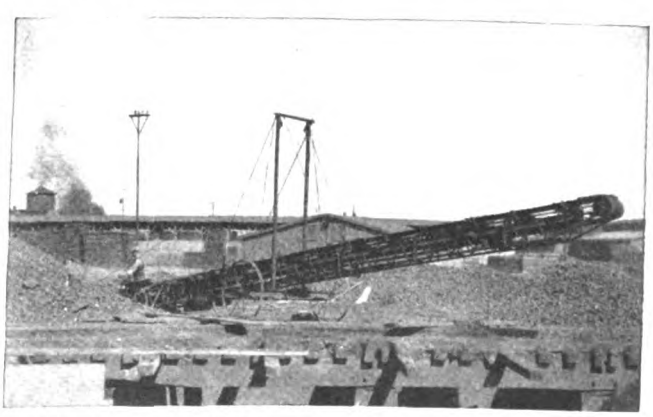
So, of course he noticed the yard gang doing their unproductive work. And it made him mad enough to go right into the G. M.'s office and howl about burying profits in the yard. The G. M. didn't want to bury profits anywhere, except in six per cent bonds, so he went out and looked.

Then he took a chance and answered an advertisement like this one.

That chance led to the releasing of nine men for productive work. Two men and two Barber-Greene "N" Portable Conveyors now handle all the car unloading and stock piling.

The fellows who run this plant don't bury profits in the yard any more—they distribute them to the stockholders.

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This Barber-Greene "N" and two men handle 70 tons of coal per day for the U. S. Light & Heat Corporation, Niagara Falls, New York. It unloads cars, builds stock piles and carries the coal to the boiler pits. This Conveyor has handled 15,000 tons of coal, during its seven years with this company.

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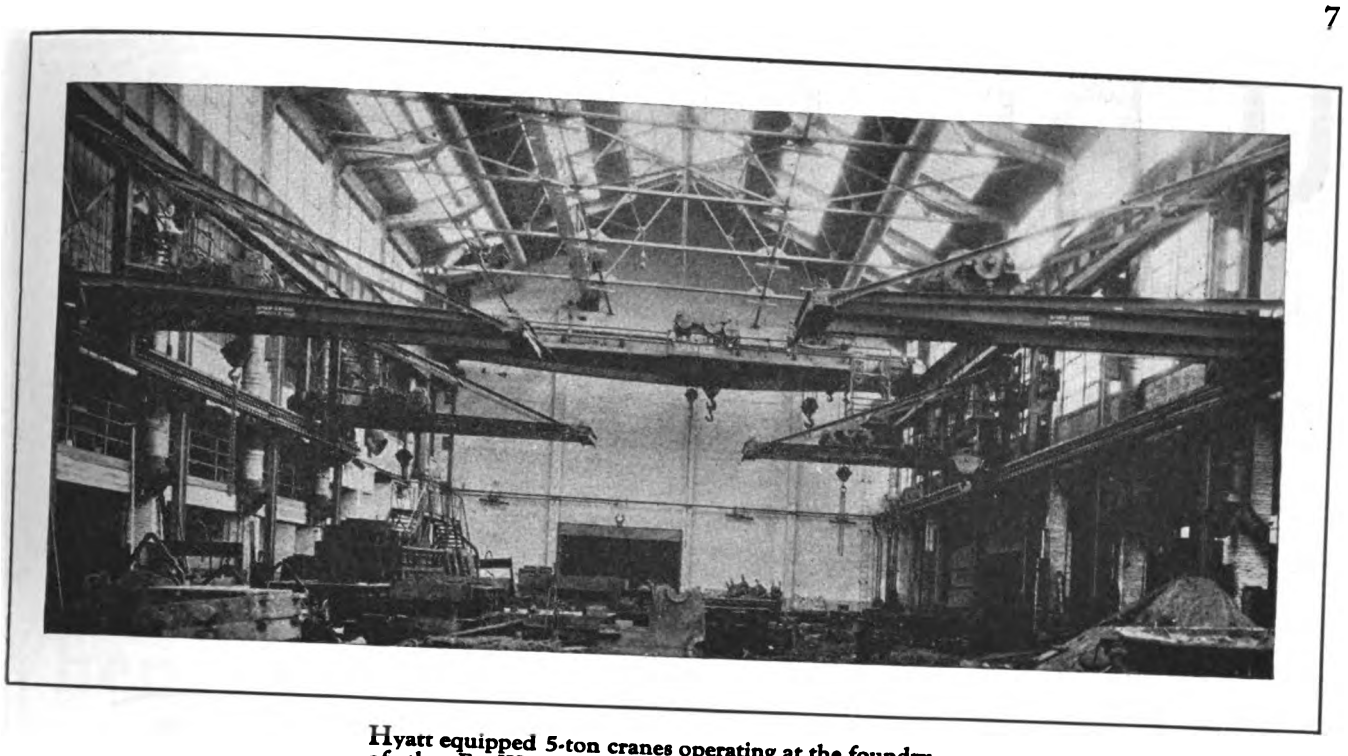
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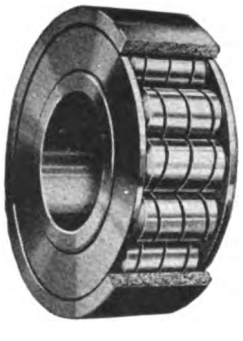
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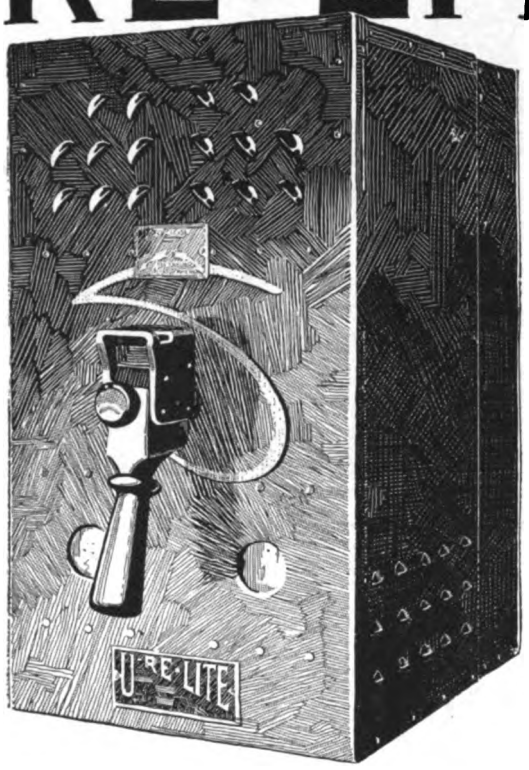
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To insure steady, uninterrupted production.
To insure industrial plants against lost time and against careless workers.

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3—The handle cannot be used to hold the switch members in against an overload or "short." It trips open without fail at the current value desired in the act of closing.

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Day in and day out, U-Re-Lite insures against destruction electrical equipment worth hundreds of times its cost.

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This famous "Cutter Curve" trademark appears in red on every U-Re-Lite. *It means*
First to the left, then to the right, turn the handle, and U-Re-Lite

* * *

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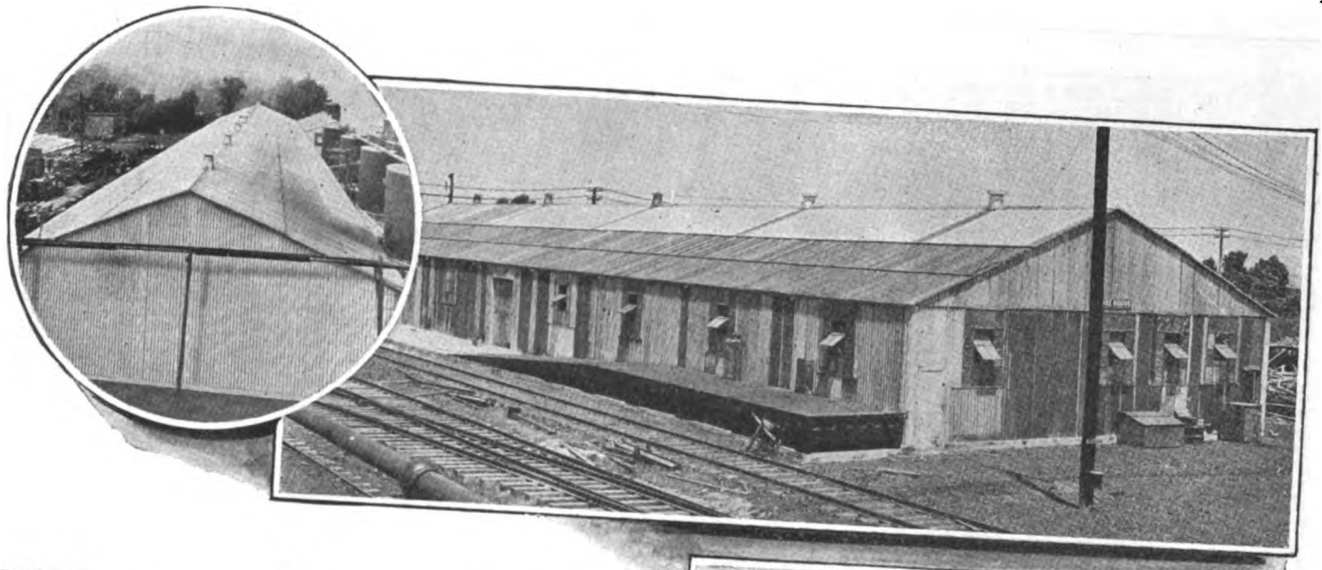


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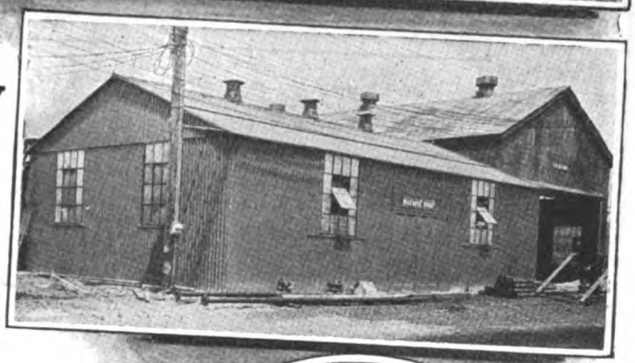
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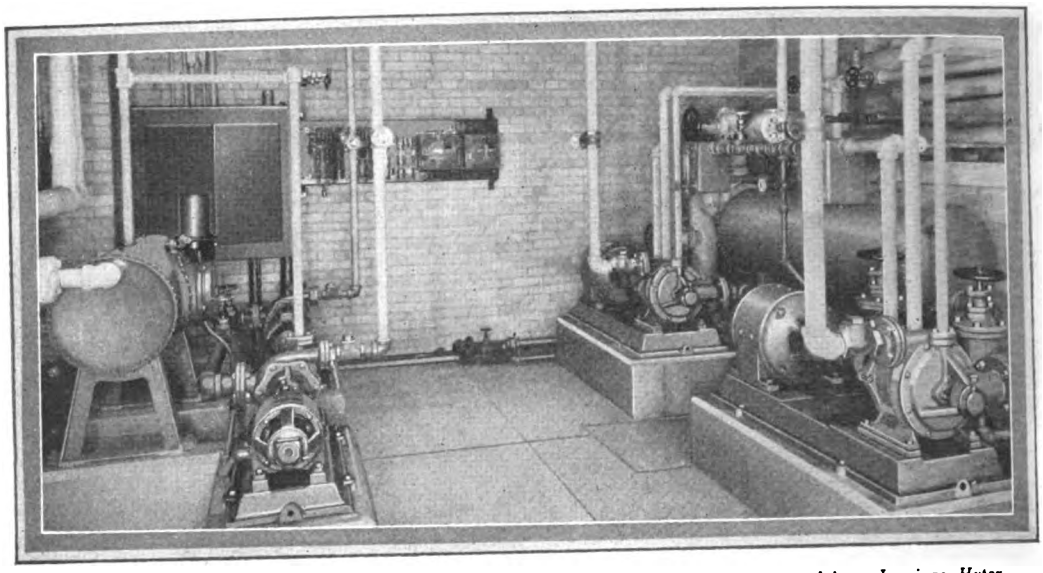
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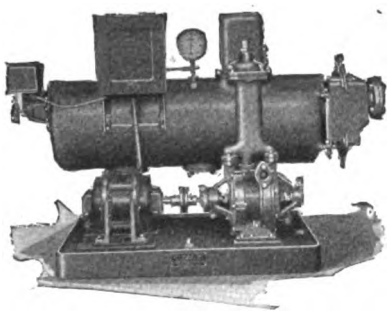
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View showing two motor-driven Jennings Hytor Vacuum Pumps, and two motor-driven Jennings Hytor Condensation Pumps in the basement of the American Surety Company's Building, New York, N. Y.

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OCTOBER, 1925

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

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Next Month

IT is a far cry, from the making of rubber to the production of the very highest grade optical glass; from testing a piece of concrete, to the making of paper out of waste material. Yet these activities and a great many more are being carried on—not in a single building, it is true, but in a group of buildings under single control—by the Bureau of Standards in Washington.

Few of us realize the extent to which this important department coöperates with our industries in solving problems of process, materials, and the like.

Next month we are going to take you on a pictorial trip through some of the departments of the Bureau, and we predict that you will (as we did) form a new conception of the importance of its work.

This, of course, is only one of the many practical, helpful features which will come to you in the November number of INDUSTRY ILLUSTRATED.

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Setting the Table for Industry

Some Things You Should Know About Work Benches

By John Herbert

THE products of American industry may be said to travel over the tops of America's work benches. This is literally true for practically all of our smaller products. Even with the big machines that are put together on erecting floors, there are hundreds of smaller component parts which require work benches for their preparation.

How much attention does the average plant manager or superintendent pay to making this important road bed of industry as efficient and effective as possible? Very little, if the truth were told. And yet, every day, over the tops of the work benches of America, actually travel cargoes of value probably equal to the cargoes daily carried by the New York Central and the Pennsylvania Railroads combined.

Isn't it important then that those of us who have charge of the progress of these industrial cargoes know and do something about the principles involved in setting industry's table?

First comes the all important matter of bench height. Theoretically, in order to get maximum working convenience for each bench hand or vise hand, we should fit the man to the bench, just as we fit him with a suit of clothes. Practically, of course, this cannot be done because the benches stay in our employ but the men quite often change their jobs. So we must strike a compromise which will best suit the average man of average height, and still not be too low for the tall man or too high for the short one. This means that the top of work benches in well ordered plants is made thirty-four inches from the floor level, bringing the top of the jaws of the average vise to elbow height of the average-sized man.



Fig. 1. Work benches should be set to bring the vise jaws to elbow height of an average man. This means that the top of the bench should be thirty-four inches from the floor.

Of course, benches are not used exclusively for vise work although in the machine shop where you find a bench you usually find one or more vises attached to it. There are sometimes certain operations which must be carried out on benches where a special height is required and which will require a somewhat lower setting of the top surface. Such cases, however, are comparatively infrequent, and are best determined by a simple form of motion study.

Next to bench height comes the choice of bench width. Single benches are usually made in narrow and standard widths. A twenty-four inch width is considered proper for a narrow bench while twenty-nine inches represents the generally accepted full or standard width. Double

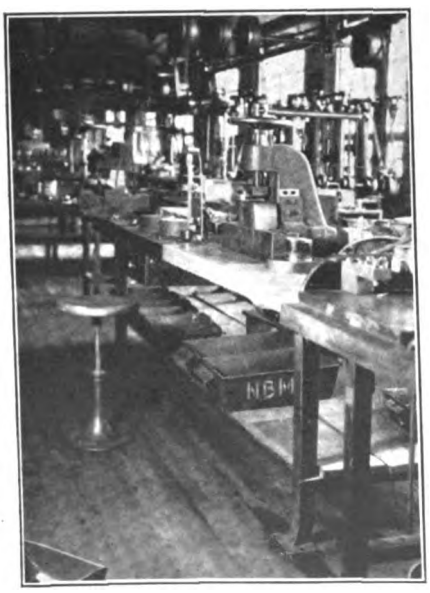


Fig. 2. Zinc or galvanized iron sheet bench coverings serve several useful purposes. They prevent loss of small parts, oil soaking of the wood or roughening of wood grain when work is slid across it.

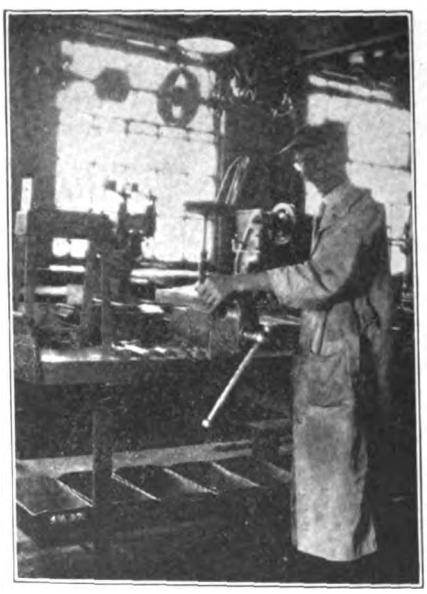


Fig. 3. The space under a work bench can be effectively utilized for part storage, particularly by means of convenient tote boxes. Careless use of under bench space indicates bad shop management.

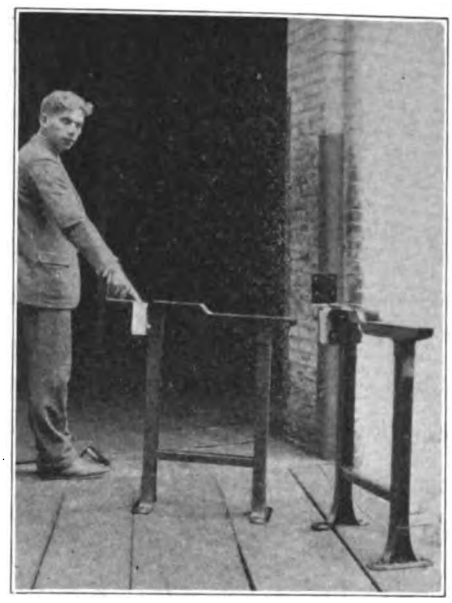


Fig. 4. Another effective use for metal bench coverings is where soldering or other heat operations are carried on. In this case charring is prevented and fire risk reduced.

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benches are similarly made in narrow and standard widths. In this case the narrow type is planked to approximately thirty-one inches width, while the wide type double bench runs to forty-six or even forty-eight inches.

Where stiffening stringers are employed in the construction of benches in connection with the use of metal bench legs, the leg spacing for ordinary work may be eight feet between centers. Wooden bench legs are no longer considered practical either from the standpoint of cost or service since the development of metal bench legs. At first these were usually made of cast iron but now the preferred bench leg is made of pressed steel which provides lightness with strength.



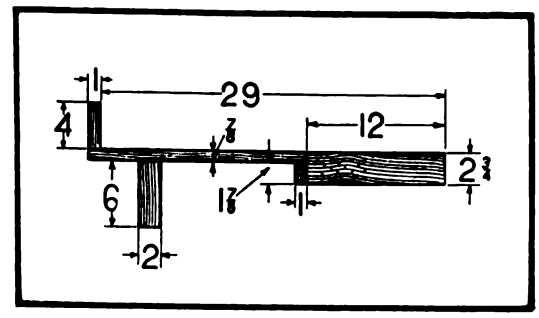
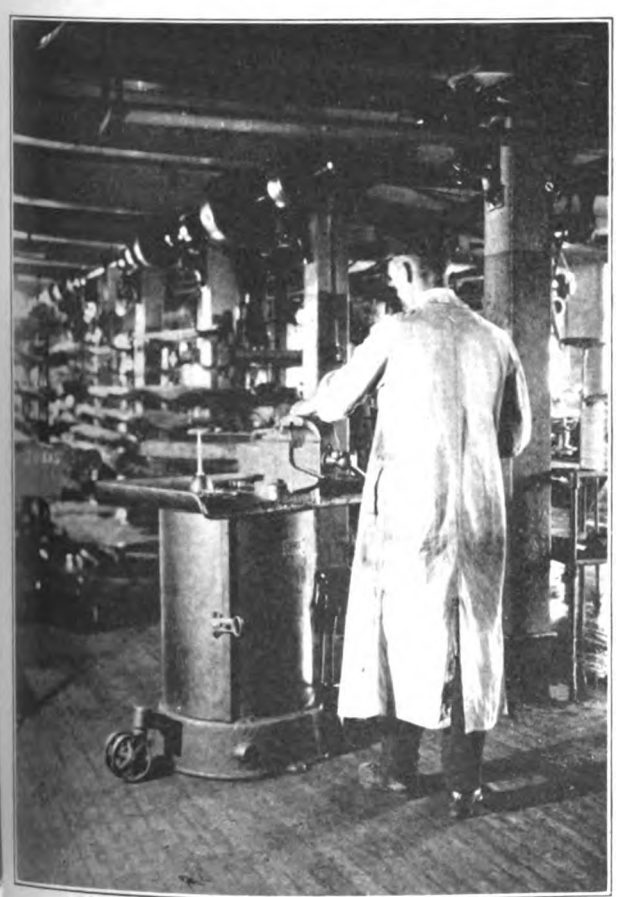
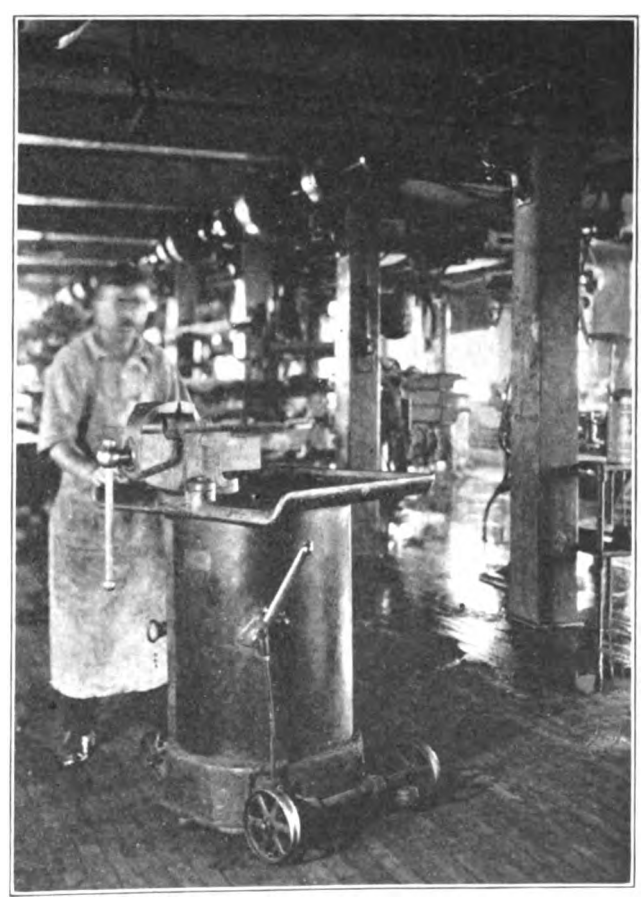


Fig. 5. At the left is shown a typical modern pressed steel bench leg of single width. A two by six inch stringer provides stiffness. Above is shown what is considered best practice in bench planking.

The method of planking a work bench and the material used for it are of considerable importance in determining its serviceability and length of life. One of the first principles to keep in mind before choosing a type of planking is the direction in which work will ordinarily be slid or moved over the bench. The grain of the wood should lie in the direction of travel. This is particularly necessary on benches in shipping departments where the work is ordinarily slid along for some distance.

Maple is the ideal wood for bench planking. But maple is not only expensive in the thicknesses required for this work, but is sometimes hard to get. A compromise is therefore usually effected. The front plank of the bench which is nearest the workman, which receives the greatest amount of wear and pounding and to which vises are fastened, is usually made of a solid





Figs. 6 and 7. The modern principle of bringing the tool to the work applies to work benches. Here is shown a portable cast iron bench equipped with vise, tool cabinet and wheels which can be raised or lowered as desired. This idea applies particularly well to repair work, construction and as an adjunct to the assembly floor.

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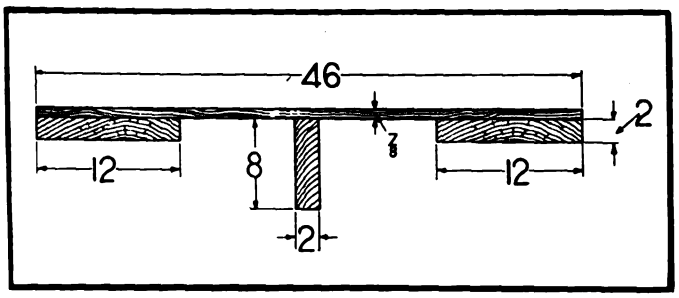


Fig. 8. This shows a method of planking a double bench which enables the use of cheaper lumber than the plan shown below. It is not as good, however, for heavy vise work.

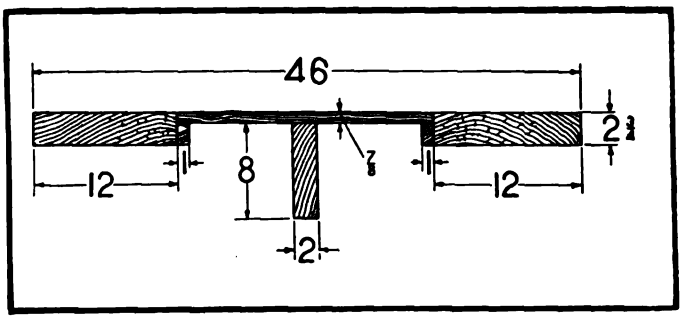


Fig. 9. For a maximum of ruggedness and serviceability, this plan of planking a double bench is hard to beat. This, like the one above, is applicable to the bench leg shown at the right.



Fig. 10. A center stiffener in the form of a two by eight inch stringer is provided for in the pressed steel double bench leg shown above. Typical planking plans are shown at the left.

maple plank three by twelve inches, running lengthwise of the bench. Back of this the thickness may drop down to seven-eighths or one inch as shown in our illustrations. Cheaper benches are planked with a soft wood front underplank topped by maple flooring.

If considerable bench construction is looked forward to, the requirements for maple planking should be anticipated as quick deliveries cannot always be had.

Another important principle to keep in mind in bench construction is that wood shrinks transversely. The fastening of planking therefore should be done so that the shrinkage will be away from the outside edges of the bench so that cracks will not be open between the front plank and the lighter flooring. This is accomplished by using tight bunghead bolts on the *inside* edge of the front plank and having the outer bolts provided with clearance holes in the bench legs, so that shrinkage is provided for.

Zinc or galvanized iron sheet covering for bench tops is sometimes dictated by special requirements. For ordinary conditions, however, the bench is better off without it because of the tendency of metal covered surfaces to "peen," under hammering or the dropping of heavy parts.

Bowling alley stock mounted edgewise is sometimes used for extremely high grade benches such as are required for instrument work. This stock is recessed so that only the top and bottom edges of adjacent strips make contact. Therefore there can be no "loosening up" of joining strips and the effect is that of a solid piece of lumber. For pattern makers the front plank is elevated two inches above the rear planking, allowing long patterns to be swung over such tools as may be lying on the back of the bench.

The above constitute some of the important things to keep in mind in setting industry's table—the common work bench. There are many modifications of understructure and superstructure, of course, that are needed for special work. Assembly benches, for example, may be profitably designed to suit the operations done upon them. This is particularly true for light assembly where the operator is seated in a fixed position. Here the matter of the arrangement of trays or racks for the component parts, screws, nuts, bolts and other items for fastening, rivets, soldering torches, electric drills, and what not, constitute an important factor in decreasing production time. All of these things, so to speak, revolve about the work bench. In some cases, the bench itself is a means of transportation, particularly in progressive assembly, where work finished is placed upon a rack superstructure conveniently arranged.

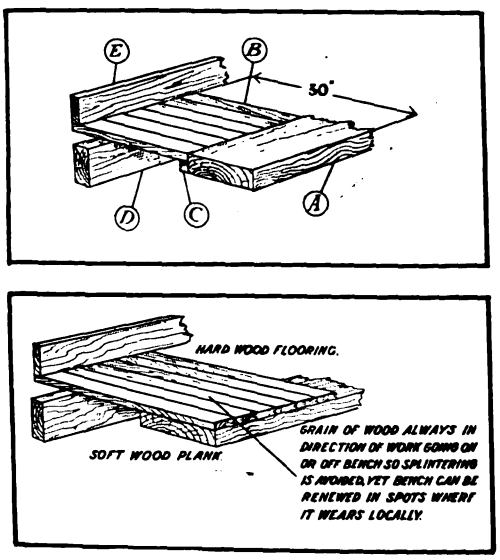


Fig. 11. Here are some useful kinks which relate to bench planking. Choice of wood for the parts are as follows: a—maple plank, b—maple flooring, c—pine or spruce batten, d—pine or spruce stringer, e—yellow pine back board.

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Fig. 1. It is no wonder that the cotton textile group has thousands of accidents yearly when people are required to work under murderous illumination like that shown above.



Fig. 2. Here's a spinning room properly lighted. When the modern illumination was placed in service in this room production increased markedly. Accidents dropped 92%—machinery stoppage dropped 67%.

You Pay for Good Light— Do You Get It?

By Owen Cobb Holleran

IT is significant that, mechanically, civilization has progressed in almost exact proportion to the development of artificial light. Certainly no age in history has seen the increase in wealth and in the standard of living which has occurred in the few decades since artificial lighting became a real factor in the industrial production of the world.

Industrially, proper artificial light is fully as important as the tools in the factory. Without proper tools, in good condition, profitable operation becomes an impossibility. With the best tools available, but with inadequate, poorly distributed light, wastage of effort and spoilage of material becomes so great that the value of the machinery is greatly lessened through the condition of gloom and glare in which it works. The proved results from adequate and proper lighting arrangements on plant activities show that the value of proper light is too great to receive anything except the most careful attention of the industry, especially since it is a fundamental that a plant pays for good light whether it uses it or not.

Research engineers employed by the great electrical manufacturing companies, by industrials and by various research organizations have conducted thousands of tests of the effect of light in industry. Their work has definitely shown the advantages which industry may expect from proper artificial lighting.

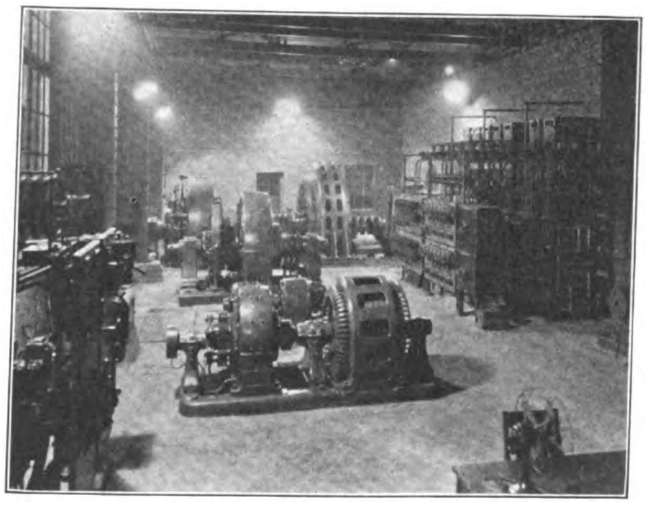


Fig. 3. A case of special lighting. The ceiling being too high for the use of general lighting equipment. The engineers solved the problem by lighting from the side as shown. Notice the clear detail and lack of heavy shadow.

In discussing the question of what constitutes proper industrial illumination we must first consider the effect of light on the human eye.

For a number of years when the question of light was discussed, the main thought was "Get more brilliancy." No particular consideration was given to the possible effect which any installation would have on the people who worked under it. The sudden increase in labor turnover in some plants, added to medical investigation of the cause of the turnover, created a very definite interest in industrial lighting. It was discovered that under certain conditions the output of workmen was seriously affected by short time exposures to flickering light or to extremely brilliant luminous sources like the old flaming arcs.

This discovery proved the key to the situation. Research work involving examination of thousands of workmen established the fact that the quality of light under which people work has a definite result on the quality and the quantity of their work. It further showed that poor light—whether it is too little, too much or badly placed—is decidedly harmful to the general health of the workman and may result in nervous diseases, anaemia and partial or total blindness. Every one of these effects was traced directly to the reaction of the system to the effect of light on the eyes.

While the combination of

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brilliant local light sources and dense surrounding shadow is a very bad combination, it must be remembered that the retention of some shadows in the plant is a necessity, as shadow furnishes the contrast on which the sense of distance and perspective is based. The total elimination of shadows would seriously disrupt the working ability of the plant crew. It is desirable, however, that dense shadows which are a direct source of danger because they augment the possibility of eyestrain, and multiple shadows which are intensely confusing, should be eliminated. Experiment has proven that single shadows in industrial plants should have a light coverage of approximately 10% of the high lighted areas. This will prevent too much contrast and at the same time allow the worker to retain the full value of his judgment of distance and shape.



Fig. 4. An excellent example of foundry lighting. The average intensity of light throughout the working space is 6 foot candles.

Illuminating engineers have long recognized that while a high intensity of general lighting is desirable, and indeed necessary, in industry, it would be considered too costly to light the entire plant sufficiently to care for the finest work being done. It has been accepted as good practice to have the general illumination sufficient to relieve all eyestrain from poor volume and improper direction of light on the general work and to use specially designed reflectors for stepping up the light where fine work is required. The problem of lighting the industrial plant is no longer a question of hanging lights wherever some individual may consider them desirable. There are highly efficient reflectors designed to meet every special requirement of industrial use, whether it be a problem of lighting a foundry floor from fixtures mounted on the walls and diffusing the light at an angle onto the floor, illuminating a cotton mill with its complicated and delicate machinery or lighting the composing room of a modern printing plant or jewelry shop, the means are available to do it properly. Location, design and power of industrial lighting installations are as much a matter of engineering design as is the design of the machinery which is used in the plant.

When proper care is taken to insure correct lighting results, the returns in money value to the factory will be found astonishingly large. Production alone will increase anywhere from five to twenty per cent. This increase is not in any way at the expense of the workman's energy. Good lighting does not force more work. Its action is to relieve the workman of the handicaps which prevent his doing a normal day's work in a given time. It cannot be expected that a workman suffering from eyestrain, and afraid of his machine because he is not sure that he can see it in the gloom of poor light and dense, confusing shadows, will be able to do the work that he will do if relieved of the burden of these conditions.

Finally, it may be said that good light is available in *every* industry, and should be universally used.



Fig. 5. An unusually well lighted machine shop. Workmen on these machines have every advantage that modern lighting experts can give them. Production in this shop increased 12% after the method of lighting was brought up to date.

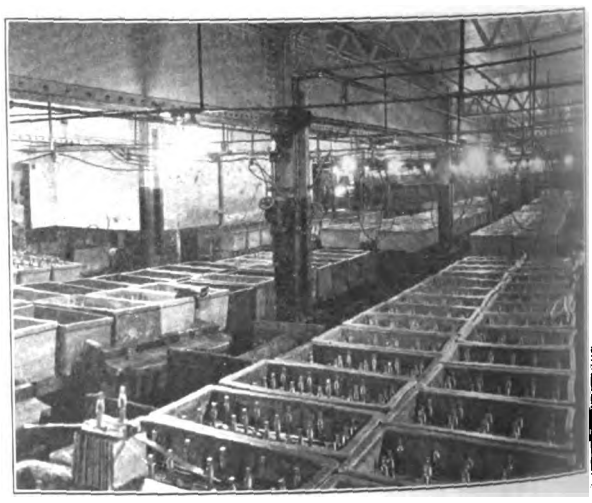


Fig. 6. Chemical plant is equipped with Benjamin Acid Proof light diffusing fixtures. Note the even spread of light throughout the plant and the clearness of all detail.

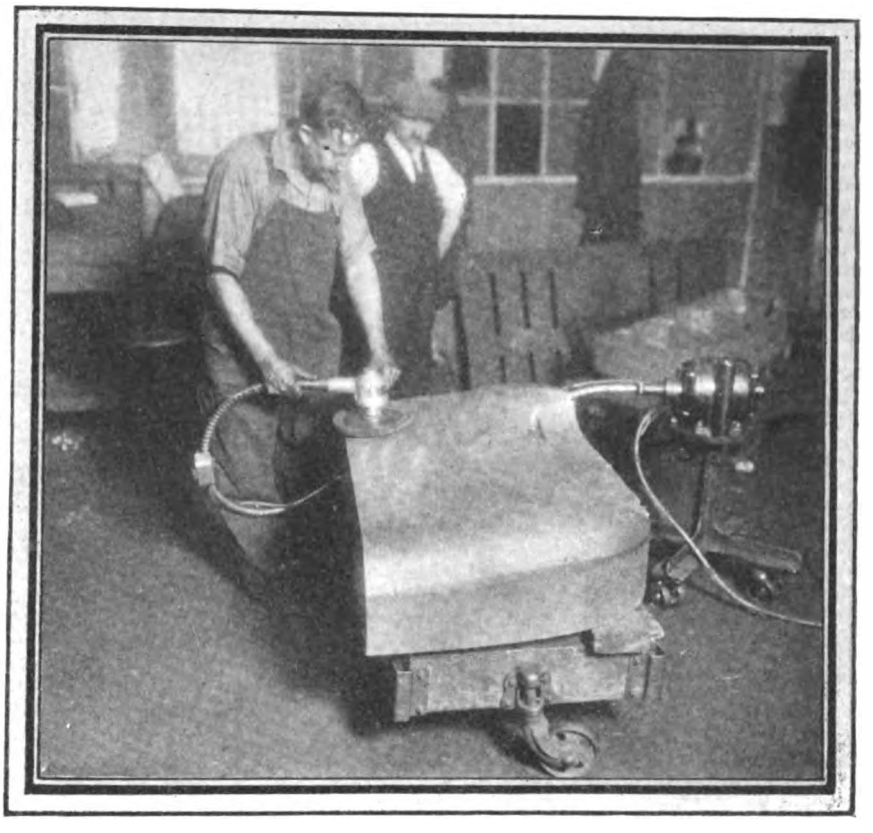
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Machine Tool Developments That Cut Costs

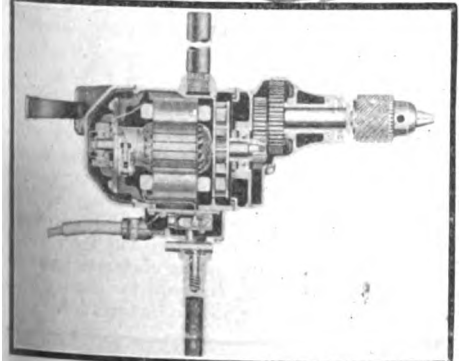
New Devices and Adaptations for Speeding Production

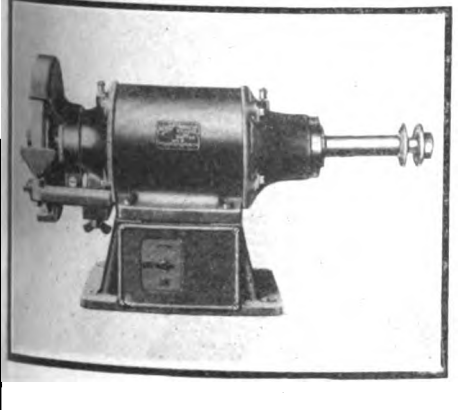
Immediately below is a Portable Sanding machine developed by The Carborundum Company of Niagara Falls, N. Y. The large view at the right shows one of these machines in use for finishing automobile bodies preparatory to painting. This machine is intended to eliminate hand filing and buffing operations.

In describing the Carborundum Portable Sanding Machine, the makers claim that it is easily handled, easily applied to the work, and its operation requires far less physical effort than is demanded by the filing process. They state that the machine is so constructed as to make it possible for the operator to reach his work from almost any angle, and because of the flexibility of the abrasive disc and adaptability of the working head, it will uniformly finish concave, convex, or flat surfaces, wide or narrow, as well as beads and moulding.



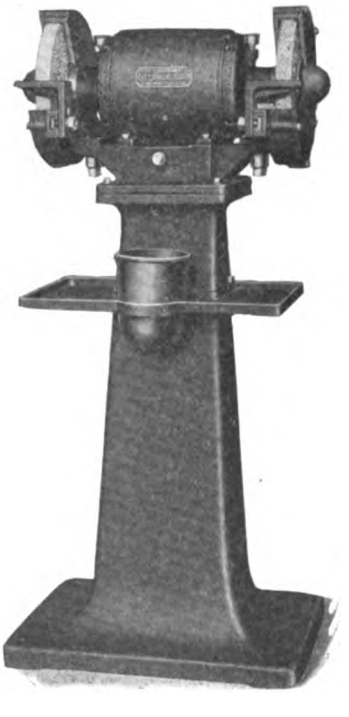






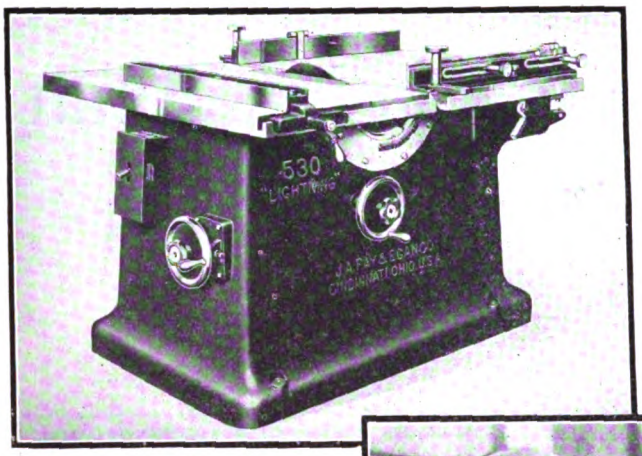
At the left are two recent products of The Hisey - Wolf Machine Co. of Cincinnati, Ohio. The upper illustration shows a phantom view of their new Standard Duty ½" Universal Motor Drill. This drill is supplied for either 115 or 230 volt current and carries ½" Jacob drill chuck as standard equipment.

The Motor Driven Combination Grinding and Buffing Machine, of which the Bench Type is shown here, is made in either Bench or Floor Types, and of ½ hp. and 1 hp. sizes in each type. All of these models are supplied for either direct current or alternating current, 110 or 220 volts.

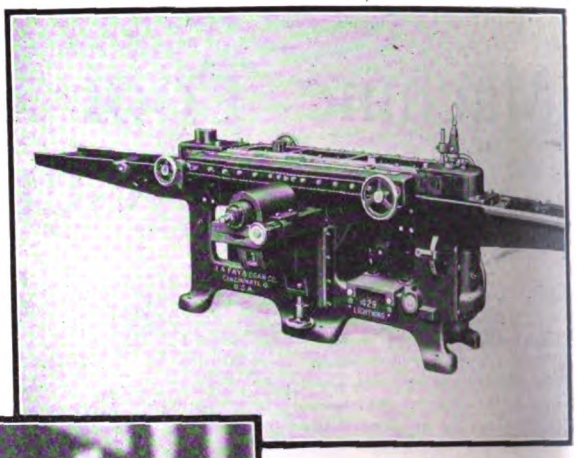


The Cincinnati Electrical Tool Company, Cincinnati, Ohio, manufacturers of Portable Electric Drills, Grinders and Buffers, have recently redesigned their Grinders and are now furnishing them equipped with fully enclosed wheel guards, adjustable to wear of wheels as shown in the accompanying illustration, at the left. These guards comply with the safety standards in the various states, and insure absolute protection to the operator at all times. The grinding rests may be tilted to any angle, making these grinders especially attractive for grinding bevels or tools of all kinds.

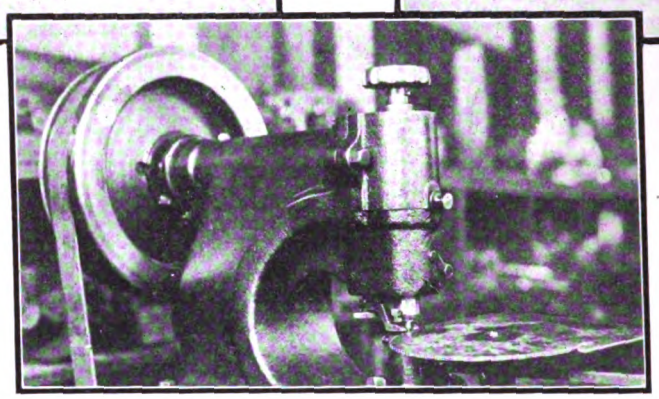
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A new Combination Mitering, Beveling, and Dadoing Machine has recently been put into production by J. A. Fay & Egan Co., of Cincinnati, Ohio. The manufacturers state that this machine, especially designed for intensive production, is constructed to withstand severe conditions in coach and body factories, planing mills, sash and door mills, casket factories, and the like. With a 16″ saw, it will cut off 30″ wide, 1″ thick, or 27″ wide, 4⅛″ thick. With arbor angled at 45 degrees, will cut through 3½″ stock. Will dado up to 2″ wide, 1″ deep, with a 10″ head, and will rip up to 31″ wide to right of saw, and 21″ wide to left of saw, when using double rip fence. The Motor-driven machine requires floor space of 5′ 1″ x 3′ 4″; the belt driven, 5′ 8″ x 5′ 4″. The machine requires 5 horsepower.

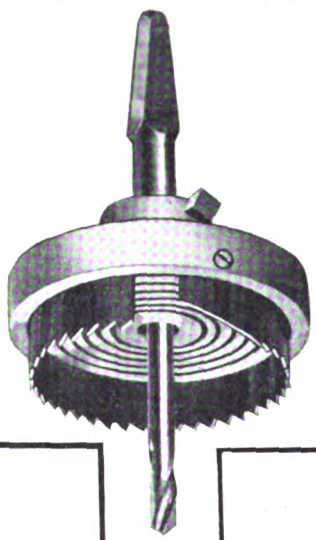


Above is the new Beltless Motorized Ball Bearing Automatic Glue Jointer and Edge Molder recently developed by J. A. Fay & Egan Co., of Cincinnati, Ohio. Designed for making fine glue joints in furniture, cabinet, piano, box, sash and door factories, tank work, etc., the manufacturers claim that it will do more accurate work, many times faster than is possible by hand or on the old reciprocating types, and is the only Automatic Glue Jointer which can be set instantly to make either a straight, hollow or spring joint, the last being a positive preventative for long stock opening at the ends. This latest model is made with a series of extra pressure rolls at each cutter head, so that it can be used as an Edge Molder, working stock as short as 4″ at a greatly reduced cost, as compared to work done on a Shaper Jointer or Tenoner. These extra rolls also improve quality of work on long stock by holding it rigidly while being passed over the cutter heads.

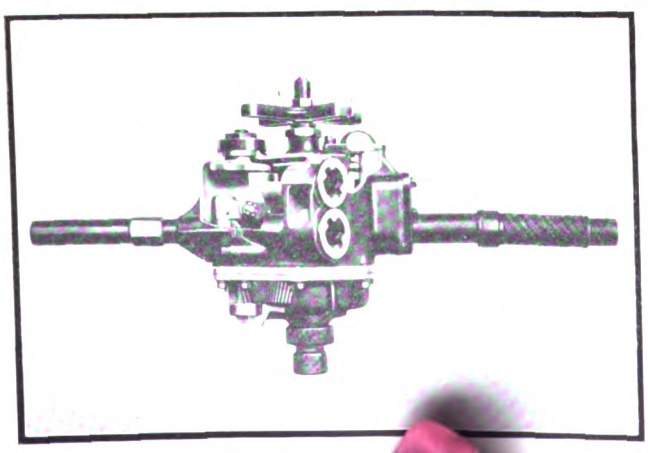


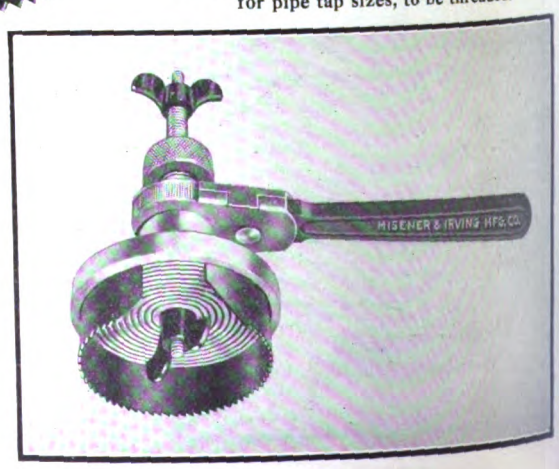
Rapidity of action—fast cutting—20 to 30 inches per minute—no distortion of metal and long life of punches and dies with low replacement costs are outstanding features claimed in the operation of the improved Campbell Nibbling Machine manufactured by Andrew C. Campbell, Inc., Bridgeport, Conn., shown above. Although the "nibbling" process in working with sheet metal is comparatively new in America, machines to do this work are coming into great demand, chiefly because of the time-saving element. Using a nibbling machine, the tool maker or sheet metal worker is enabled to cut internal and external designs with ease and rapidity.

Shown below is a new design of 4 cylinder pneumatic drills which has been brought out by the Ingersoll-Rand Company, 11 Broadway, New York City. The manufacturers state that this new design has been developed to overcome every trouble formerly experienced by the users of pneumatic drills. A complete line of this type is now available, in both reversible and non-reversible sizes. It is claimed that one feature alone—the speed governor—will, in approximately a year's time, pay the entire cost of the drill in the amount of air saved. Furthermore, every wearing part is renewable at small expense. The speed governor limits the speed of a drill after it has passed the point of maximum horsepower and so prevents racing and extra consumption of air.

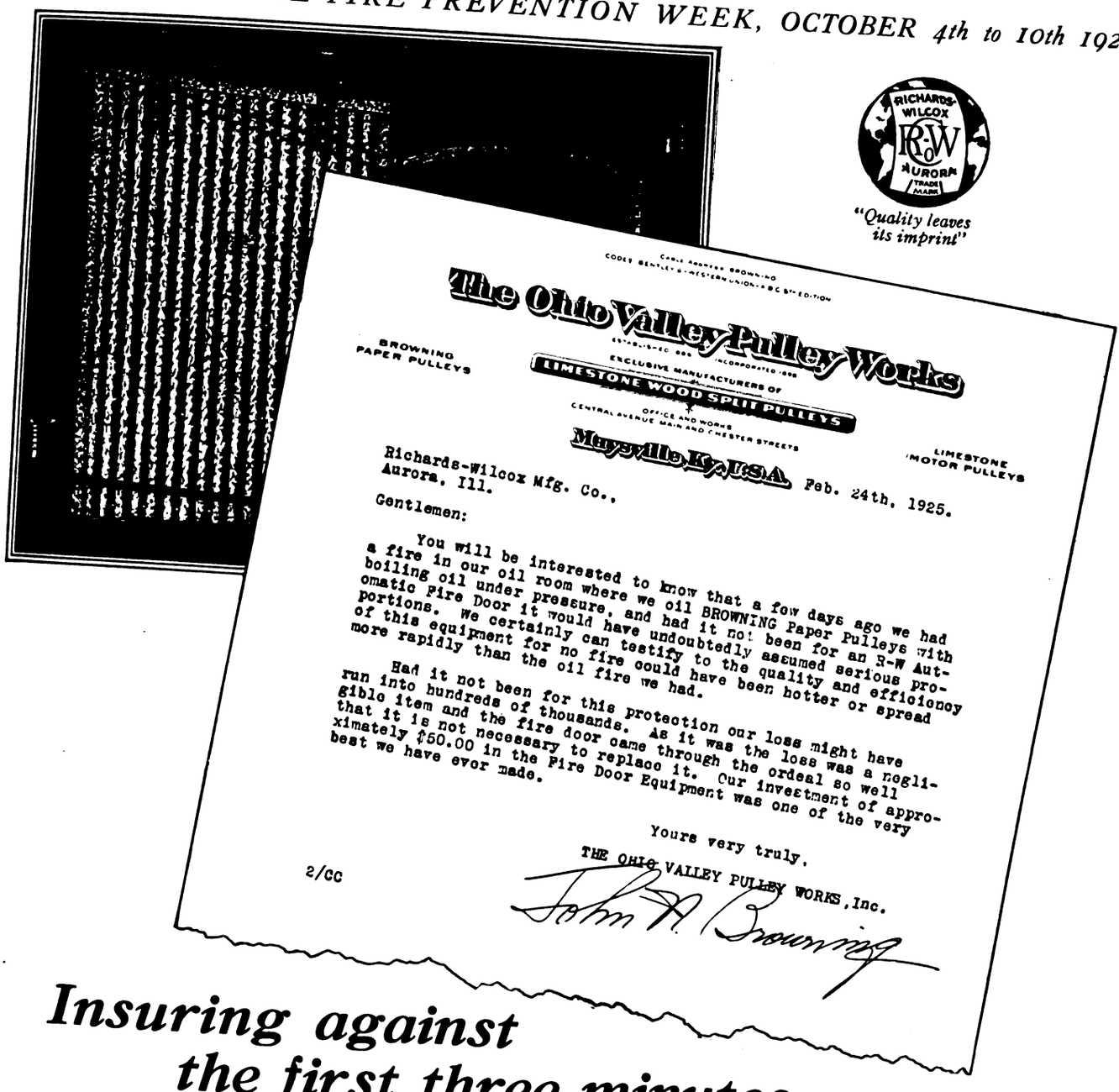


Misener & Irving Mfg. Co., Inc., of Syracuse, N. Y., offer new types of the Misener Rotary Hack Saws, shown at the left and below. One model, operated by ratchet handle, cuts diameters from 1″ to 3½″ by ¼″ variations; another cuts outside diameters of pipe or conduit from ¾″ to 4″ pipe clearance. The bit-brace model is furnished in three sizes: to cut from ¾″ to 2″ by ¼″ variations; to cut clearance holes for iron pipe or conduit; and one for cutting holes for pipe tap sizes, to be threaded.





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BROWNING PAPER PULLEYS

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LIMESTONE MOTOR PULLEYS

Maysville, Ky., U.S.A. Feb. 24th, 1925.

Richards-Wilcox Mfg. Co.,
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Gentlemen:

You will be interested to know that a few days ago we had a fire in our oil room where we oil BROWNING Paper Pulleys with boiling oil under pressure, and had it not been for an R-W Automatic Fire Door it would have undoubtedly assumed serious proportions. We certainly can testify to the quality and efficiency of this equipment for no fire could have been hotter or spread more rapidly than the oil fire we had.

Had it not been for this protection our loss might have run into hundreds of thousands. As it was the loss was a negligible item and the fire door came through the ordeal so well that it is not necessary to replace it. Our investment of approximately $50.00 in the Fire Door Equipment was one of the very best we have ever made.

Yours very truly,

THE OHIO VALLEY PULLEY WORKS, Inc.

John A. Browning

2/CC

Insuring against the first three minutes

When fire starts, the first three minutes count infinitely more than the next three hours. Speedy action would avert dire disaster. But that is not always practicable. With R-W Automatic Fire Doors and Fire Door Hardware any doorway is made immune to the passage of the flames. At a given temperature the doors automatically close, confining the fire to point of origin. This equipment bears the label of The Underwriters Laboratories. Write for Catalogue.

The fact that R-W fire-door equipment is provided, means lower fire insurance premiums.

Richards-Wilcox Mfg. Co.

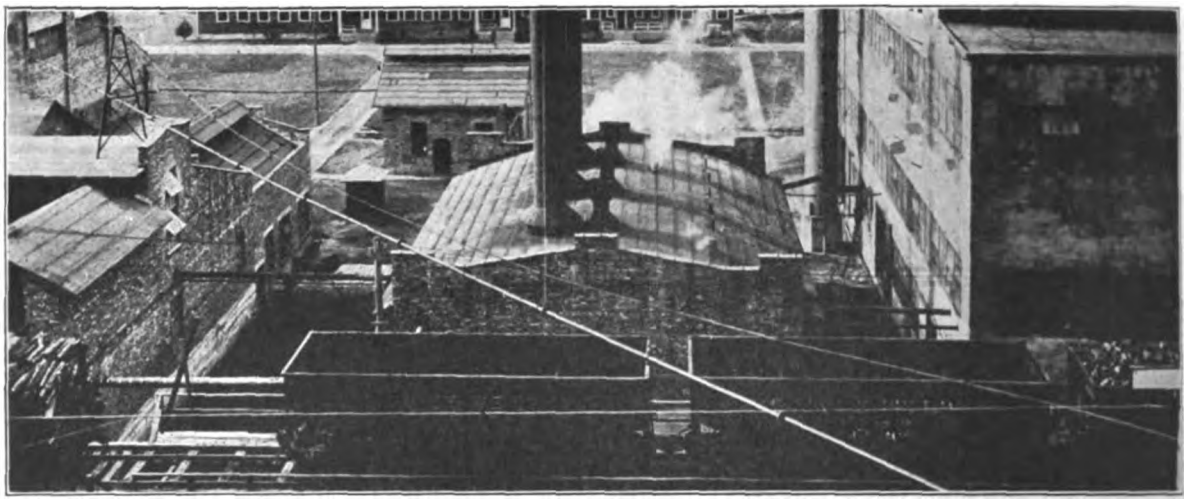
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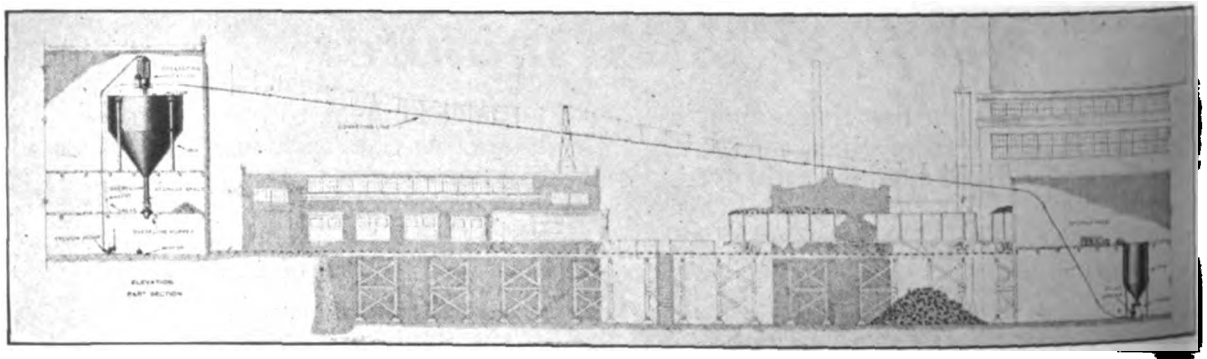
A Three Inch Pipe Conveys Materials 400 Feet Through Buildings and Over Yards

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The Results of Experience

Some Cost Cutting Methods of the Terry Steam Turbine Company

By John H. Van Deventer

ONE of the best ways of getting practical experience is to visit the other fellow's plant and take note of the methods which had been worked out and successfully applied. Fortunately for the progress of American industry the "closed door" is becoming scarcer and scarcer. Most progressive manufacturers welcome visits even from their competitors, knowing that the interchange of ideas is the greatest builder of general industrial prosperity.

While you would undoubtedly receive a cordial welcome in nine out of ten of our industrial plants, it may not be feasible for you to visit them. Hence, it is quite in order for us to personally conduct you in pictures from time to time through some of America's progressive plants. One of the first things that would strike your attention on entering the shops of The Terry Steam Turbine Company of Hartford, Conn., is the complete and clever system of boom cranes which are so arranged as to cover almost every foot of floor space. The boom crane is a "short haul" proposition. It fits into the general transportation plan, however, just as the motor truck and the motor bus fit into human transportation, but no one would think of taking a motor bus from the standpoint of time efficiency on a journey from New York to Chicago. Neither would the superintendent of The Terry Steam Turbine Company think of making a long haul with its incumbent transfers via the boom crane. Each one of these serves its local area and serves it well, but an electric overhead traveling crane running on tracks above the boom cranes, and an electric truck running on the open aisleways, take care of the longer hauls and thus coördinate transportation into an effective system.



Fig. 1. An outstanding feature is the cleverly worked out system of boom cranes equipped with chain blocks. These coördinate with floor and traveling crane transportation.

In appraising the applicability of this combination, the type and nature of

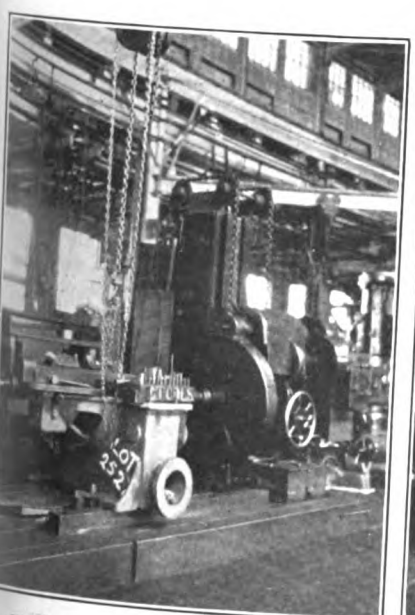


Fig. 2. Each large machine tool comes within the range of one or more boom cranes so that machine loading and work adjustment are made easy.

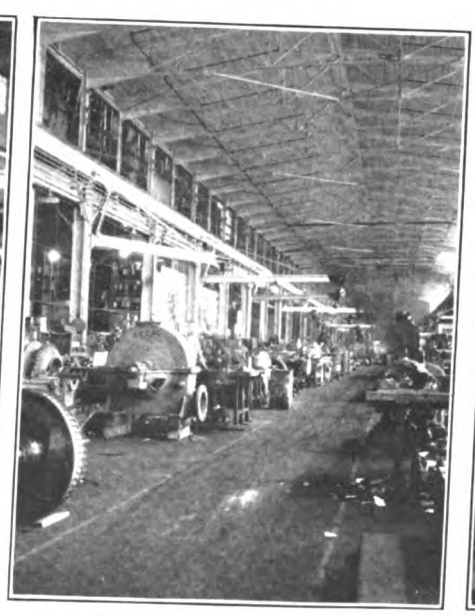


Fig. 3. The arrangement of boom cranes is such that work may, if required, be swung from one to another on the "short haul" principle.

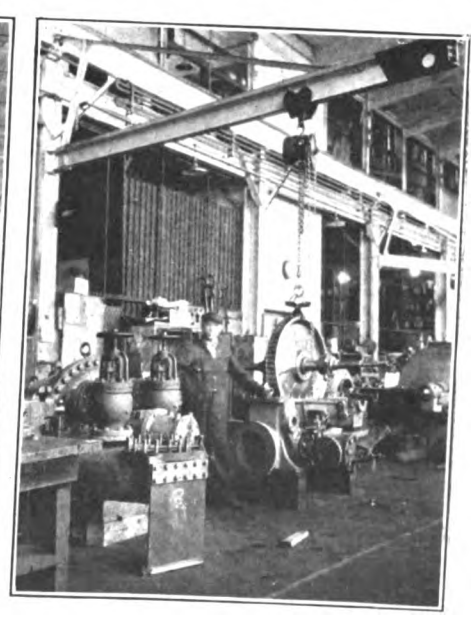


Fig. 4. The advantages of this method of handling for the assembly of this type of product is quickly recognized by the practical man.

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Fig. 5. The vertical storage of finished and semi-finished shafts prevents the set or deflection which sometimes takes place over long periods.

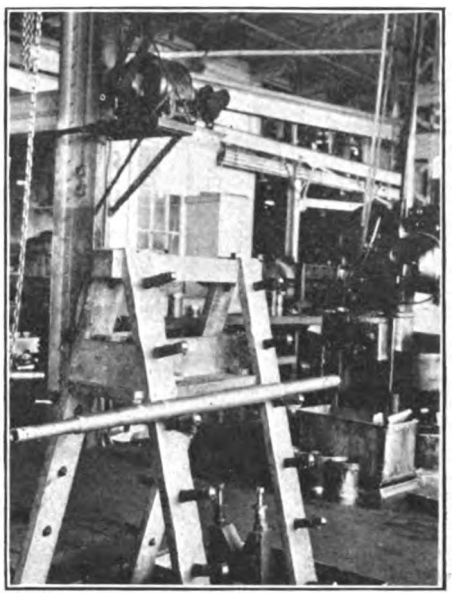


Fig. 6. Padded pins on shaft racks at grinders prevent scratching of highly finished turbine rotor shafts.



Fig. 7. Each assembly has its own stock rack where component small parts are collected. This makes shortage tracing easy.

product must be kept in mind. In this case the majority of pieces to be handled are well within the range of chain block lifts. For heavier or lighter average production the plan would not be as effective.

On this page are shown some of their interesting developments of experience applicable to storing and handling the product, but aside from the general transportation plan. One of the most interesting features perhaps is the system of collecting the component parts of each turbine in an individual steel stock rack. Here they are in physical control ready for the assemblymen when these parts are needed. The use of this plan provides what might be called an automatic shortage check. It is almost always one of the smaller parts which by its absence causes delay in meeting shipping dates and this plan makes such shortage quite evident early enough in advance to remedy such a shortage.



Fig. 8. One way to economize space under stairways is to use it. One of the ways of using such space is shown above.

Another useful idea is the storage of finished and semi-finished shafts vertically instead of horizontally. It is well known to mechanics and metallurgists that shafts suspended horizontally for a considerable period of time have a tendency to take on a "permanent set" or distortion which is very difficult to eliminate. Therefore, particularly in the case of precision machinery, it is well to adopt this method of vertical storage.

On entering the rough bar storage and cutting-off department, one is attracted to a series of white numerals and marks painted upon the dark floor. At first the purpose of these is not apparent, but after a little thought or perhaps a word from the operator of the cutting-off machine, it is made obvious. Heavy bars can be rolled against these marks and their rough dimensions determined very readily and without lifting. This is a time saver well worth adopting.



Fig. 9. The [illegible]ing of lift truck boxes with the number of [illegible] obtained facilitates proper [illegible]ding.

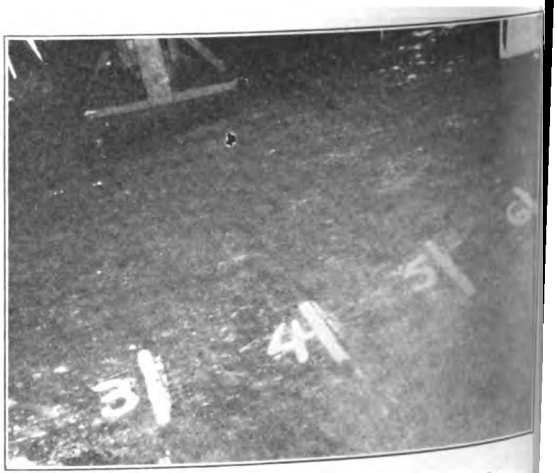


Fig. 10. These floor marks in the steel bar cutting-off department enable heavy bars to be roughly sized quickly and without lifting.

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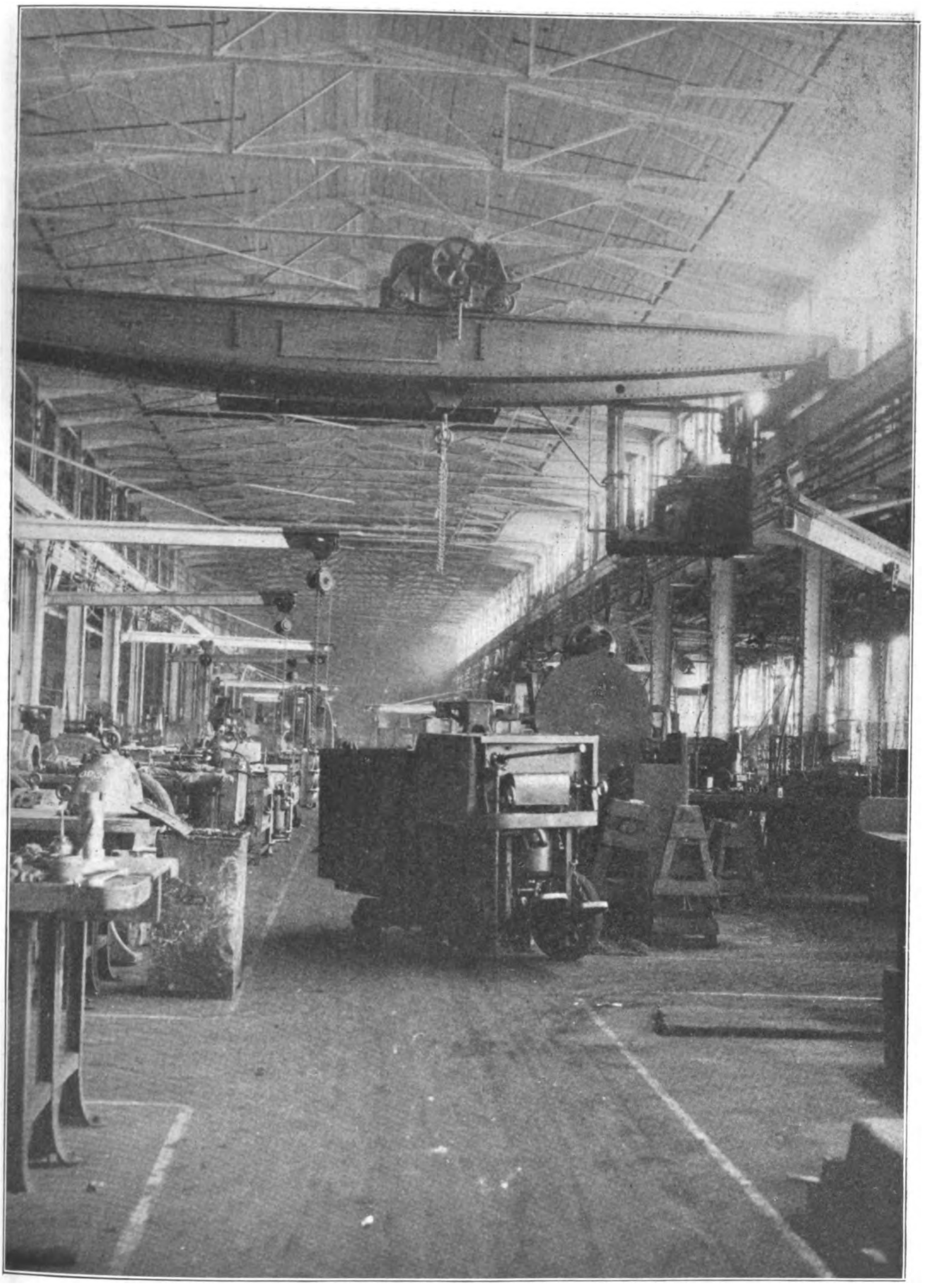
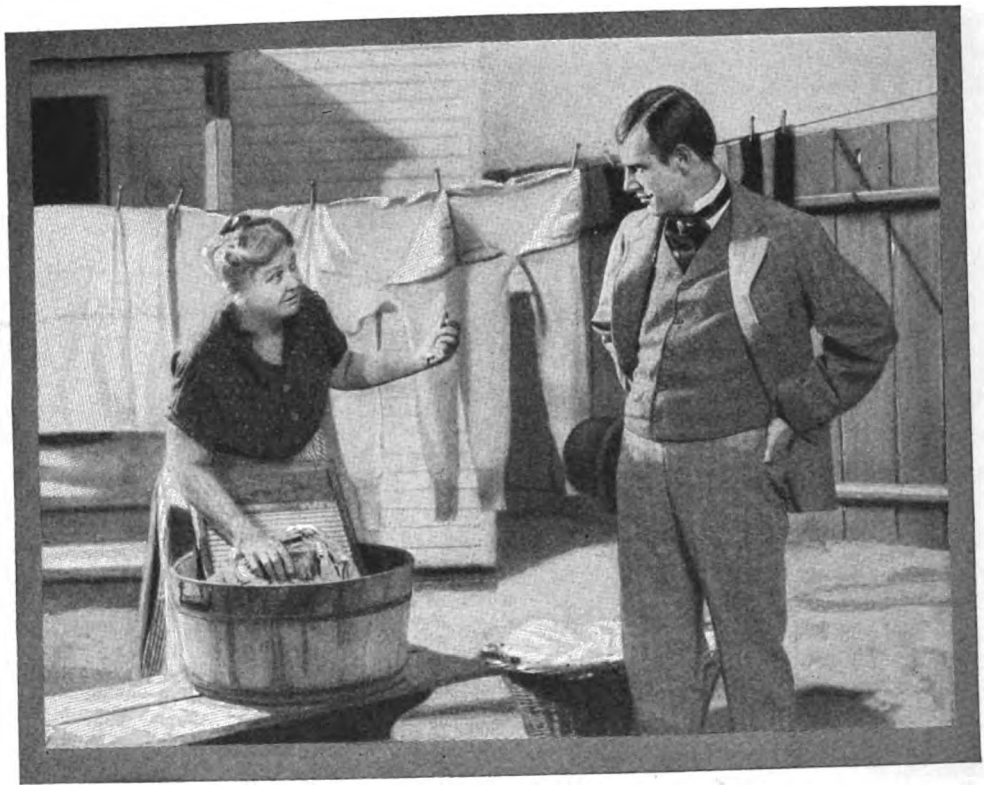


Fig. 11. Coördinated Transportation

This is the main bay in the machine shop of The Terry Steam Turbine Company. It is a good example of the coördination of transportation. Electric truck, boom cranes with chain blocks, and overhead electric traveling crane, all work together to keep things moving.

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A letter from a Self-made Mill Man to his Son

Dear Tom:

Mother says your letter reminds her of a letter I once wrote her when we were engaged. She had put off the wedding until I had the little factory started. My first partner, Ashley, and I disagreed about the price to pay for a power saw and planer. I wrote her that he was extravagant. We must buy the best thirty-six-inch saw obtainable anywhere, he argued. That was Ashley all over; sported $4.00 underwear when mine cost only $2.00. We shouldn't, said he, buy a saw at the lowest price per inch or per pound or per anything but the feet of lumber it would saw in its lifetime. I just panned him to your mother for his extravagance.

Mother's answer was: Ask your washerwoman about underwear before deciding about the saw.

I took the hint, and Mrs. McGinty, with an outpouring of brogue, backed up by a clothes line full of exhibits, proved the case for Ashley's sturdy garments.

When we grew to be the biggest in our line, I had a motto printed and stuck around. You've seen it in the purchasing agent's office.

'Worth comes out in the wash'

You may say it's a far cry from Ashley's underwear to the savings you expect to make on the piping systems in your wonderful new plant. But business-wise they are not so different. When you think of plant temperature as an important production factor, involving not only labor efficiency but labor turnover, you'll see underwear and a heating system are one and the same thing.

I'm willing to bet you right now that the low bids are for a steam system and you'll find that pretty expensive underwear when you begin to pay the fuel bills. All the money I'm putting into this venture I've made out of McLaughlin's Heat Distributing Company. He can profitably sell heat as a commodity, just like light and electric power, due to the operating economies he effects by always using hot water. It seems ridiculous to see the money a father makes out of hot water heating lost year in and year out on his own son's steam heating system.

The best advice I can give you on a heating system, a power equipment or anything else is the basic principle McLaughlin has always used. Here it is: —"Buy plant equipment as if you had to make your living selling its performance against the performance of anything else that can be found on the market today!"

Think this over, too, Tom. A man can be an expert on just about one thing. Your forte is chemistry. Mine is lumber. Neither of us knows piping systems. That's why I always call on one company that does know. They've seen all kinds of piping systems and piping supplies go into the wash and come out of the wash since your grandfather was a young man. That's Grinnell Company. They guarantee performance. Better see them.

Well, anyway, it's your child, but since you asked me to the christening, I've got to say I'm against the name "Price." So long, boy. Good luck. Mother sends her love.

Dad

* * * * *

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Fire Protection for Factory Windows

How the Rolling Steel Fire Shutter Reduces the Risk

By Milton L. Cornell

BUILDINGS located in cities must consider the company they keep. As a rule, they have no control over the hazard presented by their neighbors and yet they must expose large areas of window openings to possible surrounding fires.

A careful analysis of the losses among fireproof buildings in the great Baltimore fire showed 100% loss of contents in nearly every case. The spread of the fire was of course from one building to another. The loss from damage to the buildings proper averaged 70%. The records of the San Francisco fire show similar results. The upper seven stories of the Burlington Building in Chicago were literally gutted in 1922 from a fire across the street. This was one of the most modern of fireproof buildings but the loss of records was irreparable.

The neighboring fire is not the only threat to the exposed window surfaces. Fires in the floors below will often climb and spread on the outside of the building through these poorly protected exposures. A properly designed fireproof building should segregate any fire to the floor where it starts, but the windows are nearly always the weakest points. This is equivalent to building a heavily armored vault, filling it with securities and specie and leaving it at night with the door ajar.

An added danger in large cities is the height of the buildings. The fire department cannot fight a fire in the upper part of a modern skyscraper. Downtown New York might burn off its upper half while thousands of firemen watched the bonfire from the street, waiting for it to come within reach.

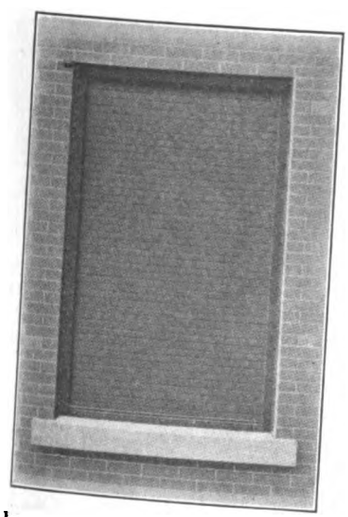
Many high buildings are now constructed throughout with metal window sash and frames. Many of these, however, are glazed with plain glass. Plain glass cracks, breaks and is gone before a trivial fire. Wire glass is much pre-



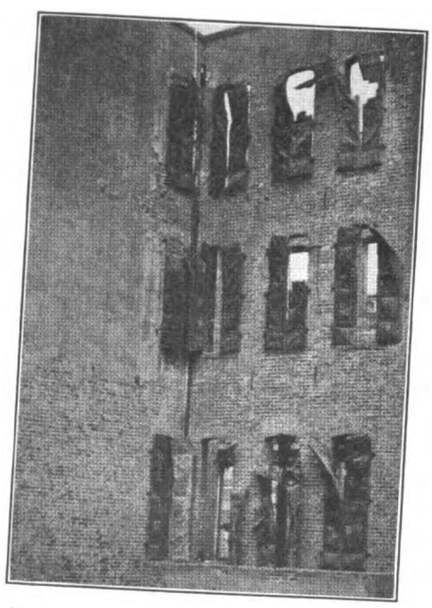
On narrow alleys in particular, fire hazard from adjoining buildings must be carefully considered.



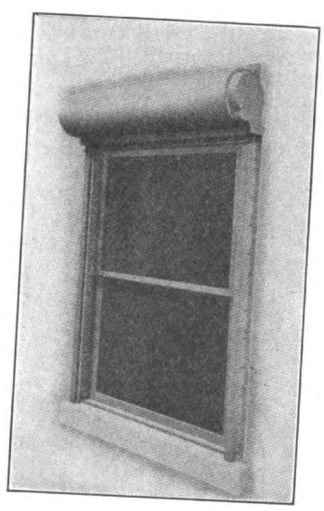
The plant shown above is protected against the fire hazard of the old wooden building on its left.



In new buildings architectural provision can be made for self contained steel rolling shutters of the concealed type.

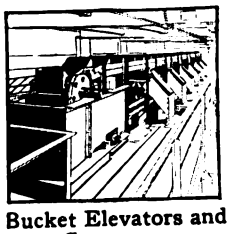


These fire shutters had wood cores covered with tin. Protection was lacking when the emergency occurred.



On existing buildings the shutters are usually mounted on the exterior face of the wall.

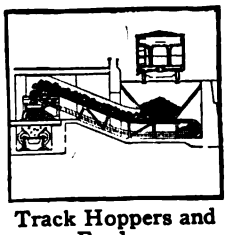
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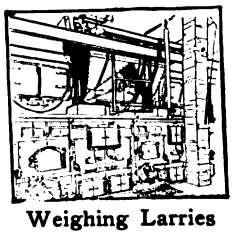
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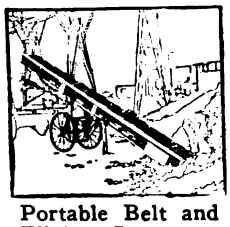
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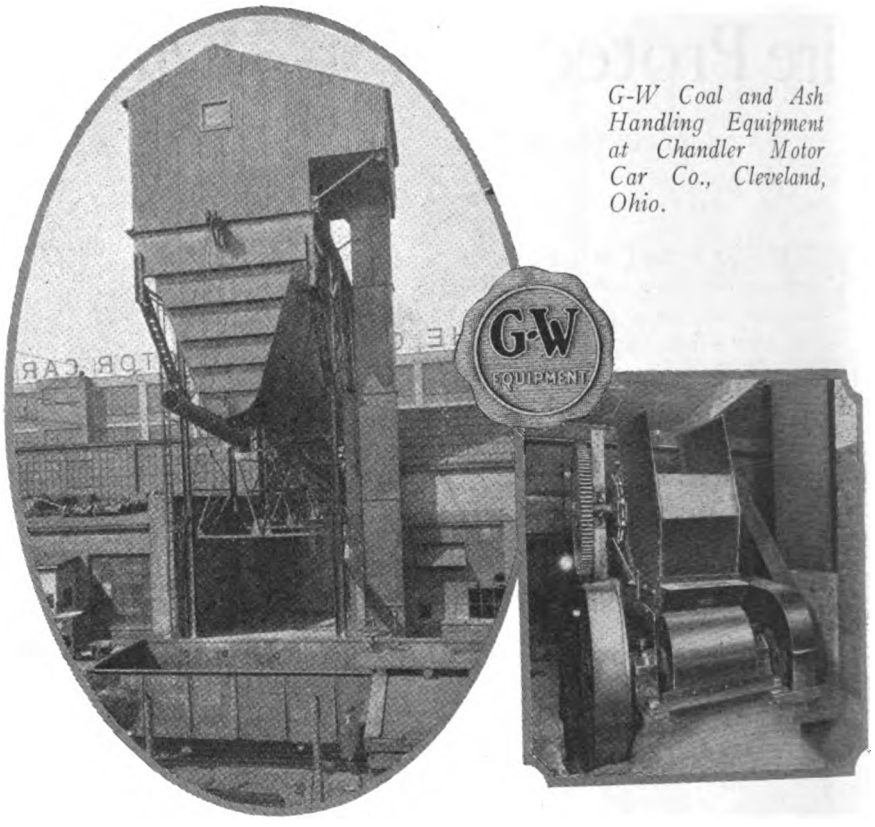
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Formerly, at this plant, coal was shoveled from the cars through manholes to the boiler-room floor and then, when loaded into the stokers, handled again with a bucket and small hoist.

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Quoting Mr. C. M. Kirkpatrick, Equipment Manager:

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"In addition, by crushing the coal at the plant we are saving an average of $.50 per ton in the cost of the coal, a saving of $2,000.00 per year. The total saving effected by the Gifford-Wood Equipment is therefore $4,704.00 per year."

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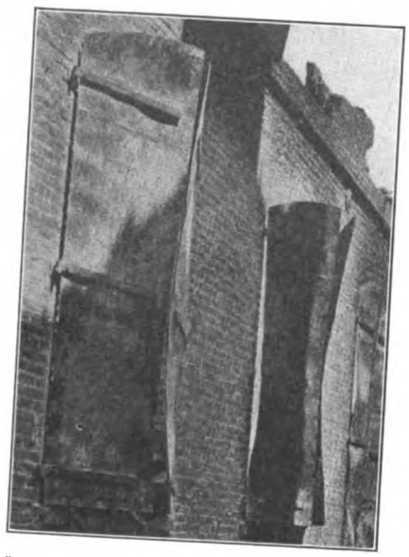
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ferable but no glass can stand the punishing heat of a big blaze. Glass windows need supplementary protection.

Rolling Steel Shutters are perhaps the ideal protection. They are built up of rolled steel sections, designed to interlock, one in the other, making a flexible jointed all steel curtain. This flexible curtain coils up around a roller, located above the window frame. The edges of the curtain run in a steel guide on either side, making a weather and flame proof joint from top to bottom. Such a shutter, properly designed, will resist the hottest flames indefinitely, up to the melting point of steel, which is never attained. It will automatically drop, at a predetermined temperature, when it completely closes the window opening, presenting a wall of steel against heat and flame. Rolling Steel Shutters, if installed when the building is originally erected, may be placed in the window opening, above the window frame, with the side guides let into the wall. This construction permits the shutter to coil up entirely out of sight.

The construction of automatic Rolling Shutters has been considerably improved in the last few years. The manufacturers have worked in conjunction with Underwriters' Laboratories, Inc., of Chicago, and by exhaustive test have developed a reliable and very convenient product. All rolling shutters, designed as fire stops, should bear the label of Underwriters' Laboratories, Inc. This insures an approved construction with non corrodible bearings and release contacts. Unless so designed there is a possibility of the parts rusting fast in time and preventing closure. Labelled shutters can be dropped at any time from inside the building, by releasing a small chain. They can then be conveniently reset in a few seconds from the same point. The shutters can be occasionally tested to see that the mechanism is working freely and that there is no *danger* of any failure to function in an emergency.



Steel plate shutters are often warped by fire thus permitting the passage of flames.

The first cost of rolling steel shutters, like all effective fire preventatives, may seem high. When we consider, however, that $10,000 worth of rolling shutters may protect a $1,000,000 building at its weakest point, with $2,000,000 of contents, standing guard for fifty years, the eventual cost is very small. Consider that the average American building has a fire every thirty years. Look out your back and side windows and observe the fire threats around you, and figure whether or not we are short-sighted in our big cities in leaving the window openings as unprotected as we do.

Automatic Rolling Steel Fire Shutters and Doors are used in many places besides window openings. They are very convenient and effective fire stops for fire walls, elevator shafts and on partitions.

Made of steel throughout, they will stand up to fire as long as the wall supports them and as such are labelled by the Underwriters and approved by the Building Department. Rolling Fire Doors require no floor space as they coil up overhead on their roller when not in use. They are conservers of space. The roller may be entirely concealed in the wall so that a fireproof building is not marred by the effect of a clumsy fire door.

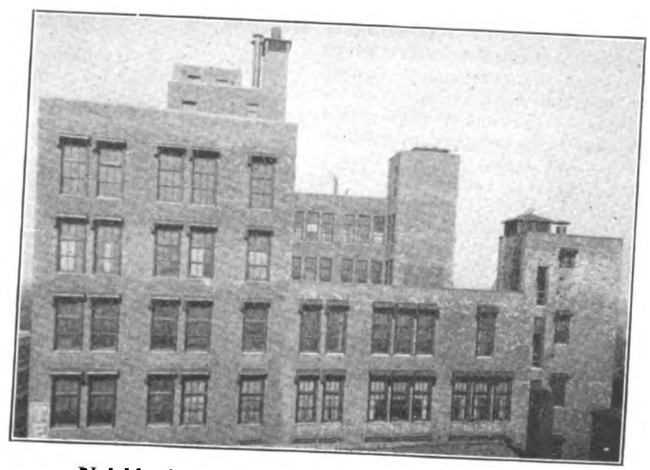
The manufacturers are usually willing to assist the designers in placing his fire doors in the most convenient and effective location without obligation.



Heat from an adjoining fire literally melted the glass in these windows permitting access of flames to the interior.



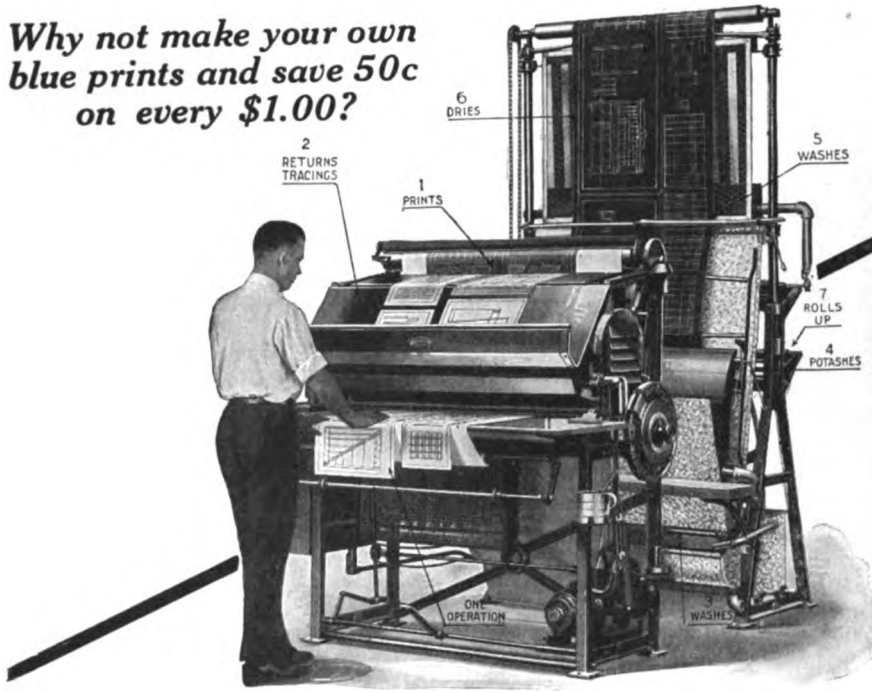
This fire was checked by a modern building, the windows of which were protected by automatic steel rolling shutters.



Neighboring garages increase the fire risk. This telephone exchange is equipped with automatic shutters because of such a neighbor.

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When you make your own blue prints, you reduce the possibility of errors to a minimum. You can check every operation, watch every job. You can prevent misunderstandings as to quantity ordered and fix responsibility for using the right tracing. If you send tracings out for blue prints, an error is rarely detected until the finished prints are returned. And then they have to be done over. That means more *lost time*.

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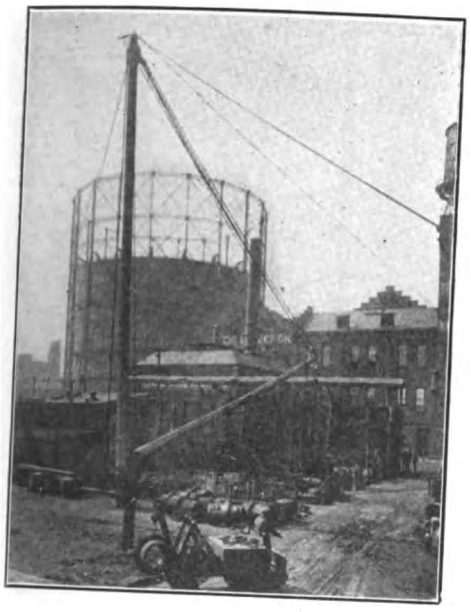
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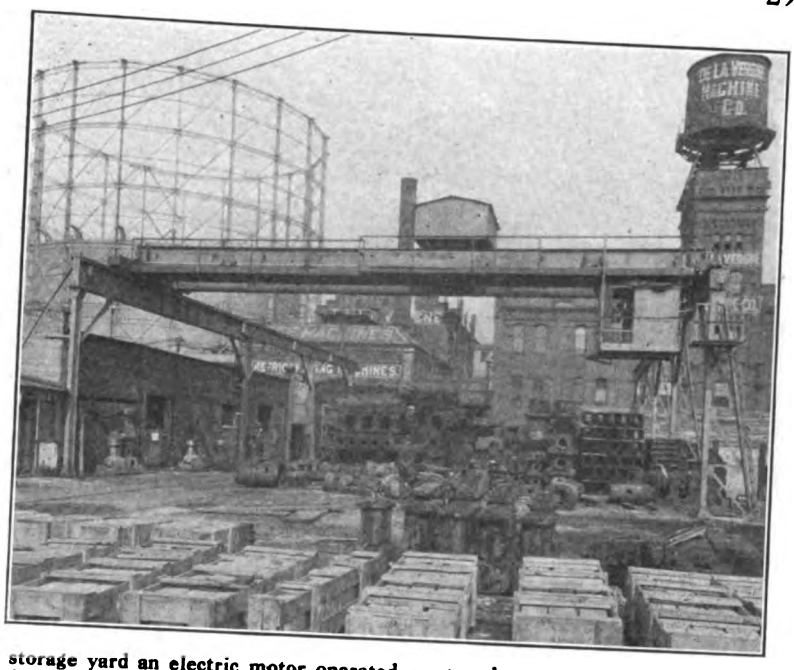
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Figs. 1. and 2. In the casting storage yard an electric motor operated mast and boom were formerly used for handling heavy castings. Frequently the electric storage battery crane truck picks up and transports its own load. The new 15-ton crane shown in the right-hand view has just been installed, and replaces the mast and boom shown in the smaller illustration.

Keeping an Old Plant Up-to-Date

Materials Handling at the De LaVergne Machine Company

By Matthew W. Potts

THE De LaVergne Machine Company, located at 138th Street, New York City, is a very old establishment manufacturing Refrigerating Machinery and Diesel Engines. The products of this plant are to a certain extent standardized, but, on the other hand, each piece of equipment is special in some respect. A few years ago, they considered the advisability of installing electric industrial trucks for their inter-departmental transportation system, and after purchasing one truck and applying it to their needs, they found that this equipment could be used in many places where they thought it impossible before purchasing. Today they have four electric industrial trucks, and their transportation of materials between their shop buildings centers about this equipment.

Fig. 2 shows the new installation of an overhead traveling crane which was installed to take the place of the equipment shown in Fig. 1. It will be noted, that although this equipment has only been in operation for a very few days (at the time the picture was taken), there is considerable improvement in the storage yard's condition, and the castings are piled higher and neater, thus utilizing the ground area to the best advantage. This same overhead crane is used for unloading coal cars by attaching a small bucket under the hook.

While electrical hoisting equipment is used quite extensively, it has been found that on a number of the less frequent operations which do not require speed, chain hoists, and hand operated transfer cranes can be used quite advantageously.

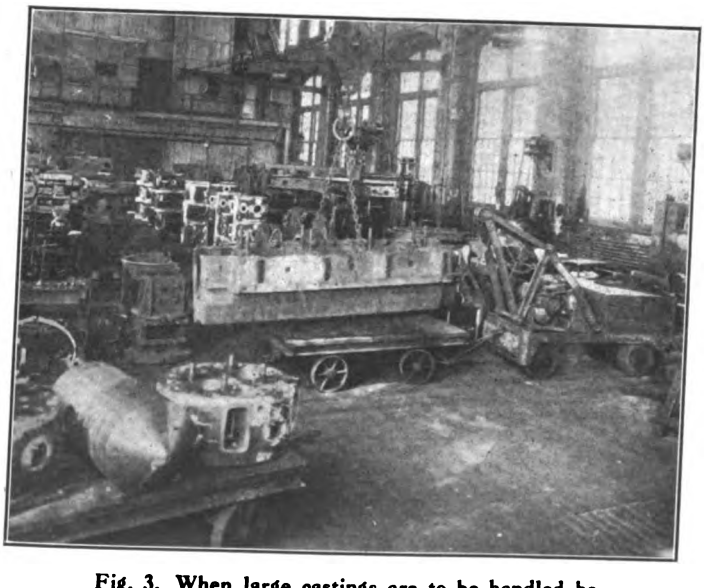


Fig. 3. When large castings are to be handled between machine shops in a semi-finished state an electric truck is used as a tractor.

In Fig. 7 we are able to portray very clearly the layout of buildings which the De LaVergne engineers have had to deal with in bringing about their present transportation and handling methods. This is a manufacturing shop between buildings, intersected at four points with bridges, and used mainly for finishing long crank shafts and other cumbersome pieces. To this bay materials are brought by means of trailers and trucks, and are then handled by the 20-ton overhead crane which has been in service more than twenty years. The bridges

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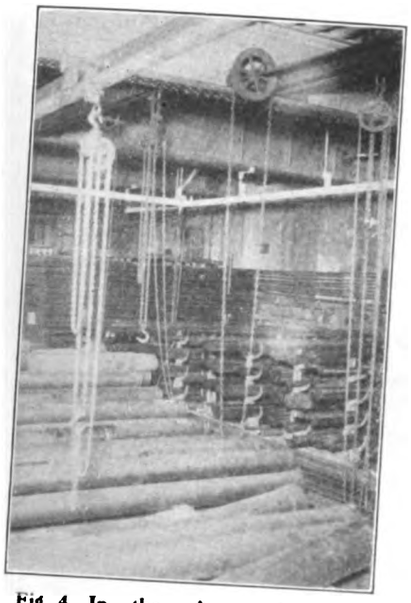


Fig. 4. In the pipe and shaft storage department, overhead monorails, hand transfer cranes, steel racks, chain hoists, etc., assist in handling these materials.



Fig. 5. In the shaft cutting department, chain blocks on monorails, and jib cranes, are used both for handling and holding the materials for cutting.



Fig. 6. In the machine shop balconies, monorails equipped with chain hoists and electric hoists assist in handling both rough and finished parts to and from the machine tools.

between buildings are used for hand trucks to transfer between departments, although the one in the center foreground has been strengthened so as to carry the narrow electric load carrying truck, shown in Fig. 9.

The building in which Diesel Engines and Refrigerating Machinery are assembled is more modern in construction than the other manufacturing buildings, as can be seen by referring to Fig. 8.

As a number of the manufacturing buildings in this plant are of multiple floor construction, it was desired to use electric lift trucks for transportation to these departments above the first floor, but due to the small size of the elevators, and their low capacity, this seemed impossible, and at first it was thought that no type of electric truck could be used in departments above the first floor. After investigation, however, one manufacturer was able to furnish a narrow, short wheel base, load-carrying electric truck that would fit on the elevator, and be able to navigate through the narrow aisles which were already fixed by the location of existing production equipment. One of the trucks used for this purpose is shown in Fig. 9.

It was found at the De LaVergne Machine Company after the electric trucks had been installed that frequently helpers and foremen spent considerable time chasing trucks in order to have them perform certain operations. This was found to be an expensive item, and greatly offset the

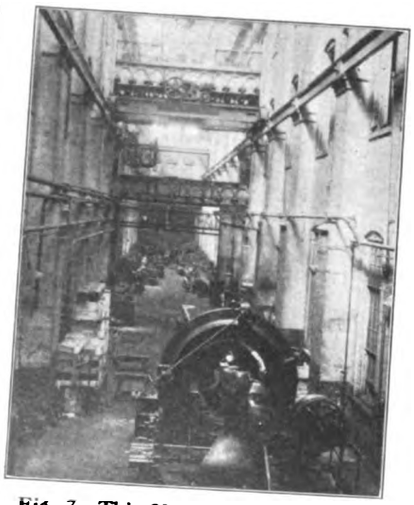


Fig. 7. This 20-ton crane operating in a shop between buildings has been in service more than twenty years.



Fig. 8. In the large assembly shop, overhead cranes, traveling wall cranes, and jib cranes equipped with electric hoists are extensively used on all handling operations.

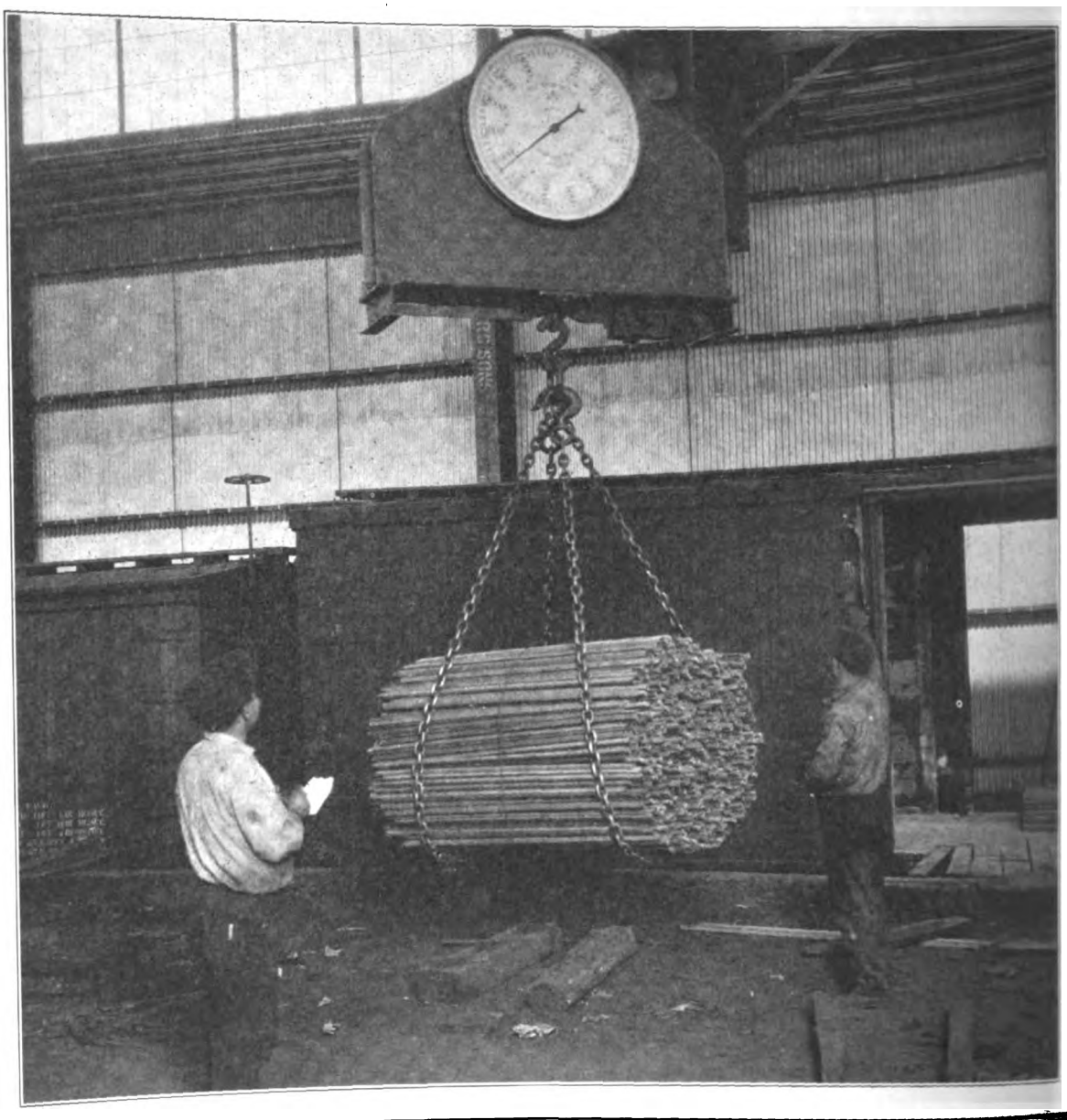


Fig. 9. This photograph is taken on the second floor of a building and shows the narrow load-carrying electric truck used for handling parts from machines to stock.

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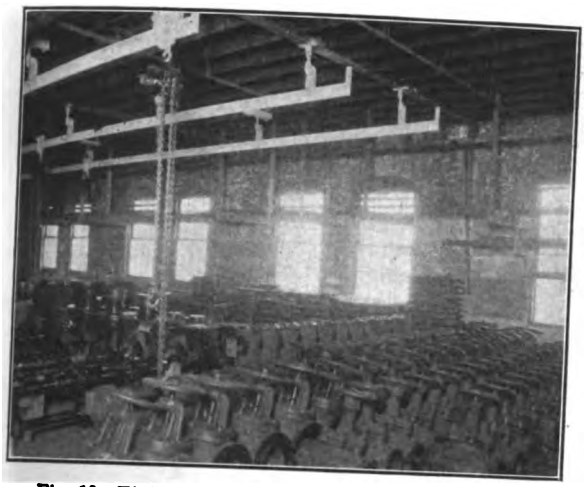


Fig. 10. Finished parts are carried in stock before assembling. In all stock rooms where heavy parts are stored, monorails of the type shown, equipped with chain hoists, have been installed to assist in handling.

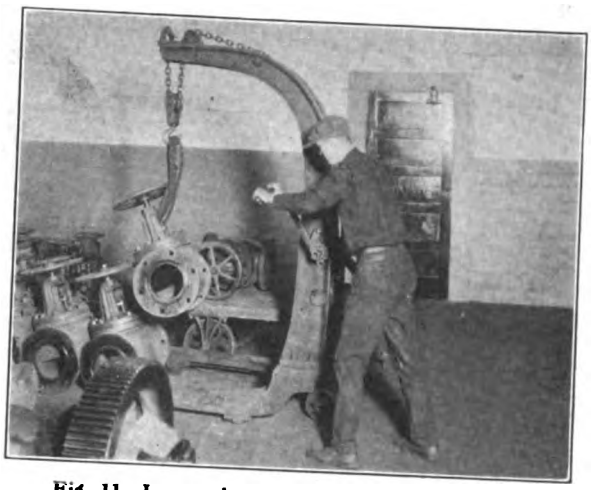


Fig. 11. In stockrooms where monorails as shown in Fig. 10 are not installed, portable jib cranes do the heavy lifting.

savings which were effected by using the electric trucks for transportation. A survey of the plant to locate a strategic point for a truck dispatcher disclosed the fact that each truck passed over or through the main alleyway between manufacturing buildings at least once every five minutes. The master mechanic then developed a light control system which required no dispatcher, and yet gave each shop foreman a method of immediately calling trucks to his department when desired. The main alleyway and the location of the signal lights are shown in Fig. 13.

The system of signalling for trucks is simplicity in itself. Each set of lights consists of three; a white, a red, and a green. Within each of the five departments requiring trucks are three control buttons. so that the foreman, or his helper, can light any one of the three colored lights. If a load is to be taken out, a red light is lit, which means that the truck should come empty to haul the load. If an empty trailer is required for loading, a green light is lit so that the truck can pick it up on its way to that department. If a serious congestion of materials exists in the department, or if the foreman is required the white light is lit. In this way, any truck passing through the alleyway is able to observe all signal stations, and upon noting a light lit knows where is the next job to be performed, unless it has been taken care of in the meantime. In answering such a call it is the trucker's duty to immediately turn out the light when he enters the department so that no other truck will respond. It has been found, with this simple system, that loads can be efficiently dispatched without any appreciable delay, and no time is required of foreman or helper to hunt the trucks. This idea might well serve in other plants.



Fig. 12. Due to the heavy machinery produced at this plant, a 15-ton crane operates over the entire shipping floor for the loading of cars.

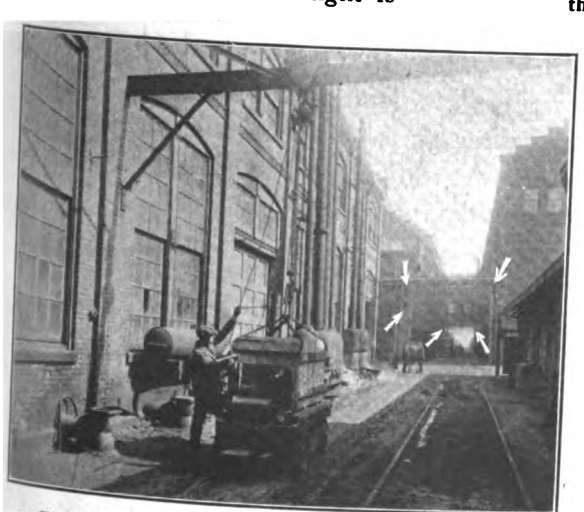


Fig. 13. General view of the roadway dividing the plant buildings. Note the location of signal lights marked by arrows. (See text.)

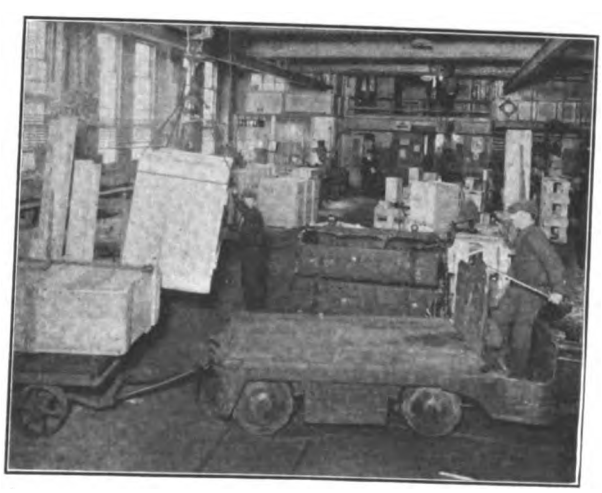
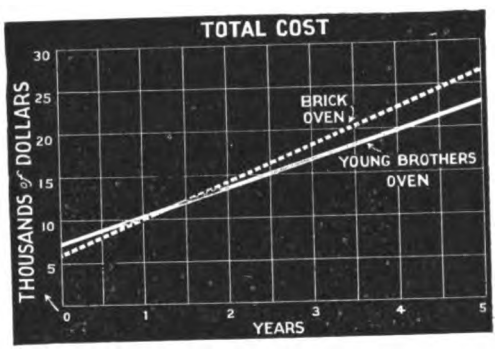


Fig. 14. After certain parts are crated, it is necessary to transfer them to another department for shipping. Load carrying trucks and trailers are used for this purpose.

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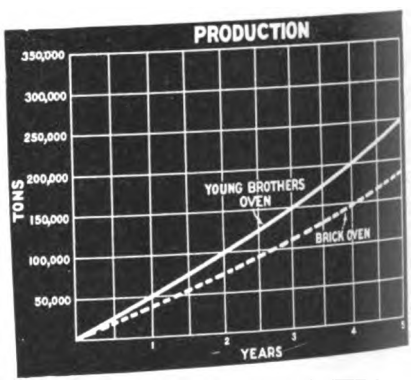
YOUR CORES ARE TOO EXPENSIVE

Unless you are using an Improved YOUNG BROTHERS OVEN



A FIVE YEAR TEST. An improved Young Brothers insulated steel core oven and an insulated brick oven were both operated side by side in the same foundry on the same type of cores and using the same type of fuel.

The charts show the estimated comparison.

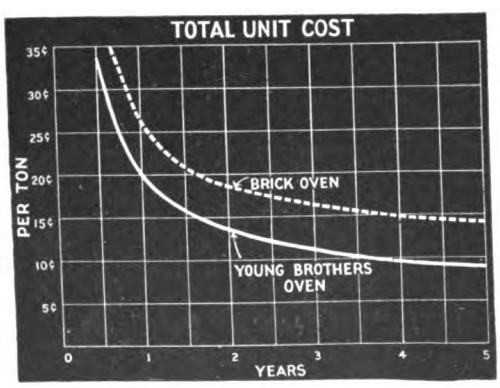


THE CHARTS.

TOTAL COST: is based on total cost which includes investment, installation, interest, depreciation, fuel and operating costs.

PRODUCTION: shows total tonnage of cores baked in each oven.

TOTAL UNIT COST: conclusive evidence as to core baking costs.



THE REASON: Young Brothers Company pioneered the movement toward insulated steel core ovens. Seven years of exhaustive research work by Young Brothers Engineering Staff have resulted in a product that is demonstrating its absolute superiority in low cost operation. At the same time the quality of cores produced is greatly increased.



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The Control of Mechanical Power Transmission

II—*The Far-Reaching Effect of Correct Belting on Profits*

By William Staniar

Belting and Transmission Engineer, E. I. du Pont de Nemours & Co.

IN the demand for industrial economic efficiency the supposed necessary evils of plant operation must be brought to the surface for analysis and inspection.

Transmission belting is one of the most necessary of plant essentials. *With it right,* the machinery is producing to capacity; *with it wrong,* there is a puzzling leak in production and, with its failure, both capacity and production suffer; therefore, is there anything in plant capacity and operation that ranks higher in importance?

The question of cost, therefore, in selecting and purchasing a type of belt should and must take into consideration, not only the purchase price, but also the expense of constant adjustment, the enforced idleness of machinery and men during such repairs and the frequent renewals necessary by reason of rapid wear of inferior types for the operation. Buying transmission belting on first cost without considering the operating conditions lowers the profits of the organization, because every loss of power through the inability of the belt to convey the unit of energy required creates a waste of fuel and steam and a weakening of the capacity of every machine in the plant with a corresponding curtailment of production.

The effect of correct belting regardless of price on the profits of an organization is shown conclusively by the graphic chart in Fig. 1. The left-hand side of the chart presents its effect on plant operation; the right, on production. In discussing the effect on operating costs and production, it is obvious that the right belt in the right place as to type and size will give correct transmission if it is based on an analysis of mechanical and atmospheric operating conditions by experienced engineers through applied testing and knowledge. This will result in more power being delivered by fewer types and brands because the selection is made for a specific purpose.

It requires power to make a belt slip over a pulley, and stretch is the foundation of slip; therefore, the right belt reduces this factor to a minimum and less power is required for the drive. Excessive slippage and the wrong type of belt for the atmospheric conditions involved, such as acid, heat, steam or moisture, causes premature failure which results in high belting costs. The selection of type almost entirely governs the life of a belt and when this is based on a scientific knowledge of the material resistance of the various belting substances, reduced consumption is the result.

Stretch and premature failure are the cause of high transmission maintenance costs because stretch necessitates frequent belting adjustments and premature failure calls for labor in replacing the destroyed power medium. Correct transmission also depends on correct belt joining, which in itself has a great effect on belt maintenance costs.

Lower operating costs by virtue of the scientific and intelligent selection and installation of power belting reduce overhead expenses and deliver a unit of production at a lower figure.

Correct belting has just as much effect on plant *production* as it has on plant *operation* because from a power standpoint they cannot be separated. If economy can lower operating costs through the mediums mentioned, it can lower production losses through less idle equipment, resulting in increased income from plant investment; less idle production labor, resulting in increased income from operating investment; and increased output, resulting in maintaining maximum production. Increased production based

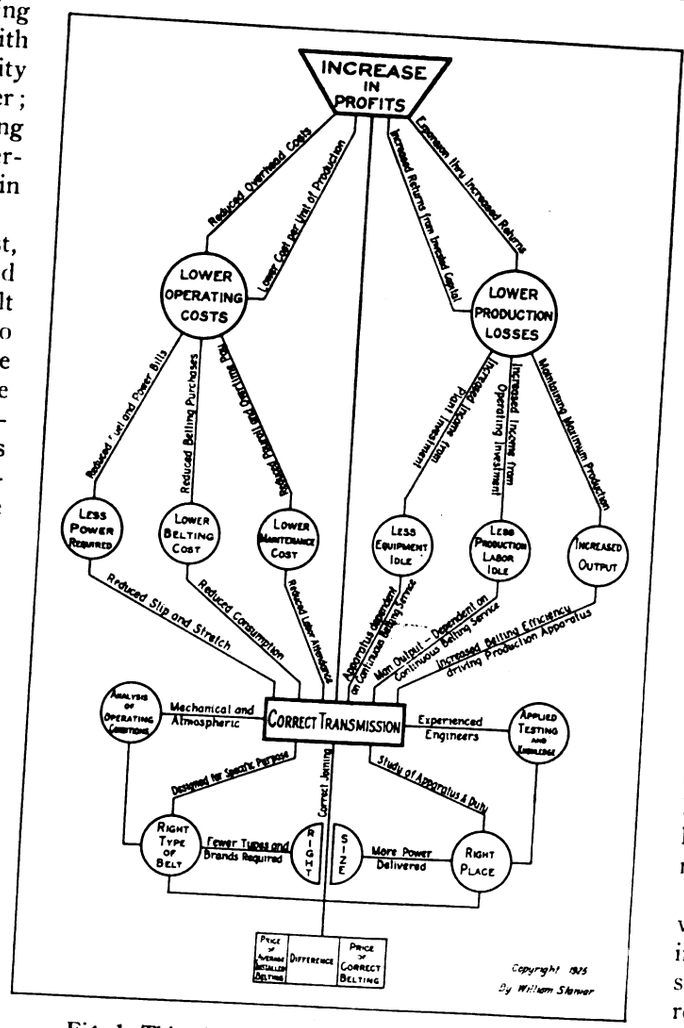


Fig. 1. This chart shows graphically the far-reaching effect of correct belting upon profits. The left-hand side traces the effects on operation; the right, on production.

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Rugged



Dodge-Timken roller bearing loose pulley.

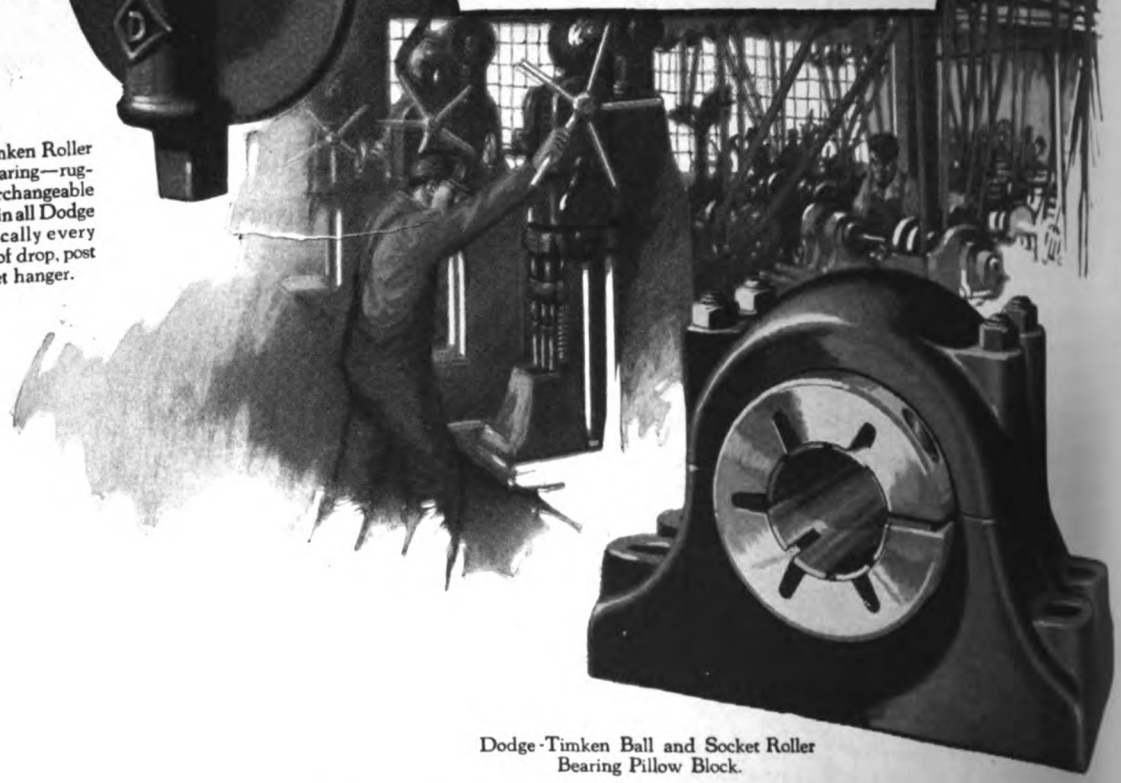
THIS means continuous power savings. It is the outstanding feature of the Dodge-Timken tapered roller industrial bearing which is now available in hangers, pillow blocks, loose pulleys, and standard unit mountings for built-in applications to duplicate machinery.

Here is a practical industrial application of the Timken tapered roller bearing that has proved its ability to stand up under severe punishment—a trouble free, power saving bearing backed by the combined engineering experience of two recognized leaders—Dodge and Timken.

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Dodge-Timken Roller Hanger Bearing—rugged—interchangeable size for size in all Dodge and practically every other type of drop, post and bracket hanger.



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POUNDS OR TONS DODGE CAN BUILD IT

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on the lowering of manufacturing losses resolves itself into plant expansion through increased returns from the capital invested and this results in increased profits for the company.

The chart shown in Fig. 1 is not a hypothesis, but is a correct graphic illustration of what a scientific study of belting and transmission problems can accomplish and what losses in both production and operating all manufacturing plants are tolerating if they persist in allowing price to dominate the selection of type, and workmen the selection of size.

Two very striking examples of belting abuse and misapplication recently came to the writer's attention and will serve admirably to illustrate the effect of this condition on production.

When similar individual belt driven machines are arranged in batteries and all are supposed to be producing the same product at the same rate per minute there is a serious curtailment of production if, due to some mechanical defect, the speed of the machine varies. The writer was called on just such a problem and found seventy-five automatic machines individually motor driven by belt. There existed a speed variation of 20 to 30 r. p. m. Investigations had been made for electrical and mechanical defects but none could be found. No thought had been given the belts because they appeared to be running nicely, but the speed indicator showed the variation on the driven wheel but the motor speed constant. The writer investigated the belting and found lubricating oil on the pulley side in varying quantities and in some cases saturation of the leather had taken place to the extent of ply separation. The oil was reaching the belt from the pulley, due to excessive machine lubrication. The variation of machine speed was caused by the unevenness of oil accumulation on each belt. Lubricating oil in its place is an absolute necessity, but on power belting it retards production and causes abuse and premature failure of the medium.

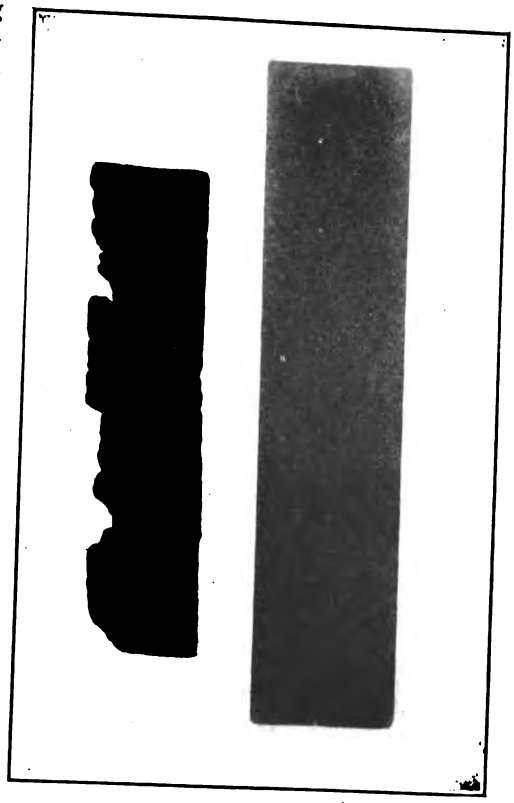


Fig. 2. An expensive and high-grade leather belt—which, properly applied, will save money and increase production—can be utterly ruined when put in a location not meant for it.

On continuous process machinery such as pulp dryers and paper mill apparatus where belting is the power medium (and it usually is) a slipping belt will have a more obvious effect on production than on almost any other class of machinery. Pulp dryers have a multiplicity of steam heated revolving cylinders arranged in drying units of varying temperatures, each unit being vertically belt driven from one long overhead line shaft. The speed of each unit must be kept constant with the other, otherwise there is a crumpling of the pulp sheet passing through the machine. This is taken care of to a great extent by cone pulleys on the line and individual unit shafts, but if excessive belt slippage is occurring due to the wrong type, the cones cannot entirely correct the fault and production suffers owing to the uneven operation of the cylinders.

This condition existed in a large pulp mill on one of the 150-ton capacity pulp dryers. The machine was not producing to capacity, still every mechanical part of the machine was working in a correct manner. There existed a crumpling action on the pulp sheet that could not be accounted for. The belting from the overhead line

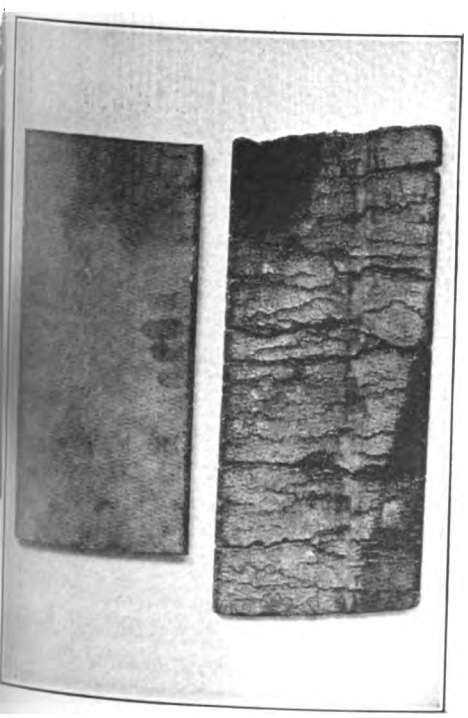


Fig. 3. Highly efficient in its proper sphere, this ply and friction fabric belt, at the left, was asked to perform where it didn't belong—and now look at it.

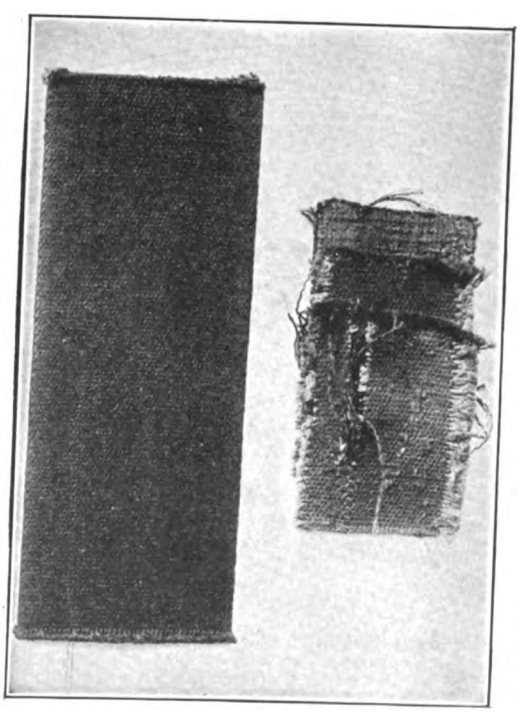


Fig. 4. Under the same drive conditions as Figs. 2 and 3, the belt at the right gave much better service because it was better suited to such conditions. In other circumstances this type of belt might be far inferior to the other two.

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Quality Facts About Belting

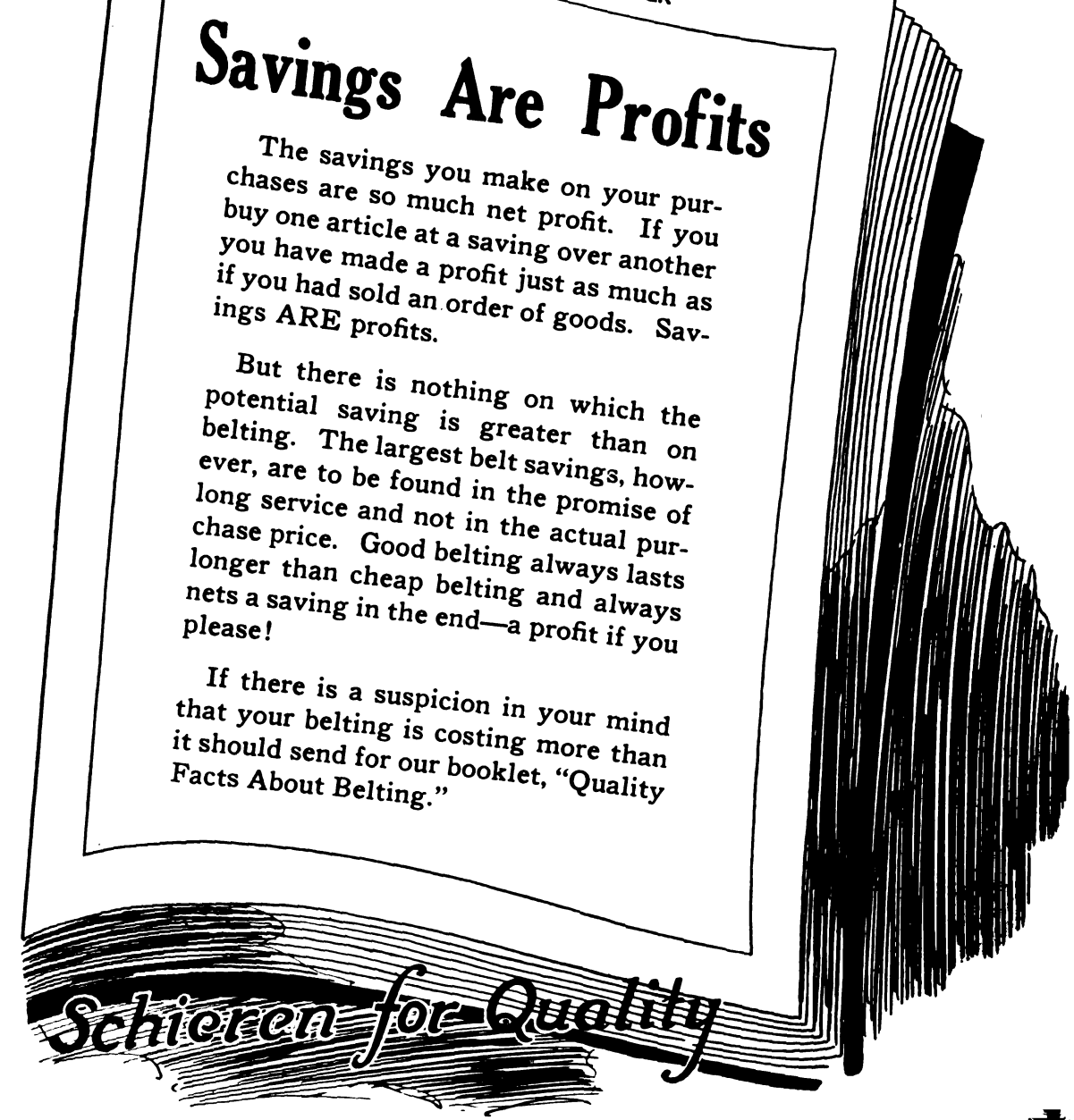
WHY SCHIEREN BELTS LAST LONGER

Savings Are Profits

The savings you make on your purchases are so much net profit. If you buy one article at a saving over another you have made a profit just as much as if you had sold an order of goods. Savings ARE profits.

But there is nothing on which the potential saving is greater than on belting. The largest belt savings, however, are to be found in the promise of long service and not in the actual purchase price. Good belting always lasts longer than cheap belting and always nets a saving in the end—a profit if you please!

If there is a suspicion in your mind that your belting is costing more than it should send for our booklet, "Quality Facts About Belting."



Schieren for Quality

Gentlemen: Kindly send me, without obligation, your series of "Quality Facts About Belting."

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to the unit drive shafts had not been thought of until finally the management was advised to investigate that particular phase of the operation. It was found that the belting being used was of a hard, thick and non-elastic type, and due to its vertical driving position was slipping excessively, this causing a different speed on each unit due to varying amount of slip on each belt. On some units the loss was as high as 10%. In this case the type of belt was absolutely wrong for the operation and therefore was the real cause of the lowered production. It was a good belt, but it was in the wrong place.

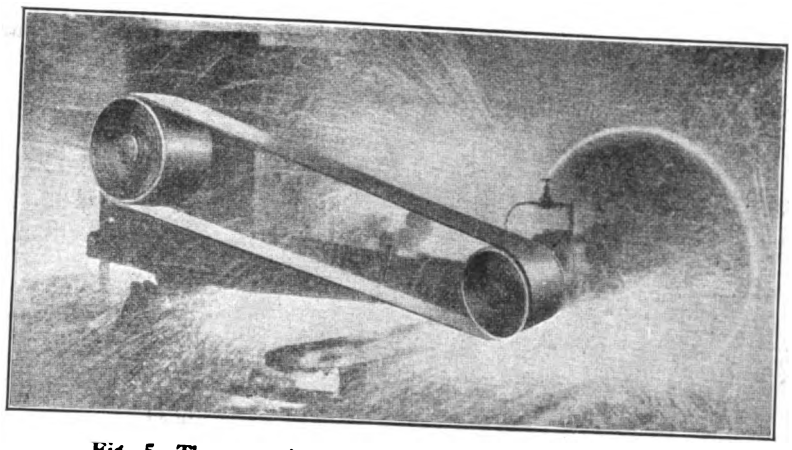


Fig. 5. The torturing conditions under which some belts are called upon for continuous service may be realized by considering this hot saw drive.

Ocular conception of a condition is generally convincing, therefore when one sees belting crack and break apart on the pulleys after operating six, thirty or sixty days it is no wonder that the question of type and type alone becomes paramount as to the solving of belting problems in almost all industrial operations. Size is an important factor for efficient power transmission but this can be worked out by formulæ and a knowledge of mechanics—whereas the selection of type must come from a study of the surrounding conditions and an intimate knowledge of the materials from which belting is manufactured. Certain industrial operations will destroy belting rapidly if there is a lack of knowledge as to the selection of type, while others will destroy it slowly, but rapidly or slowly there is something wrong when a belt prematurely decays, because where one type will not resist there are others that will.

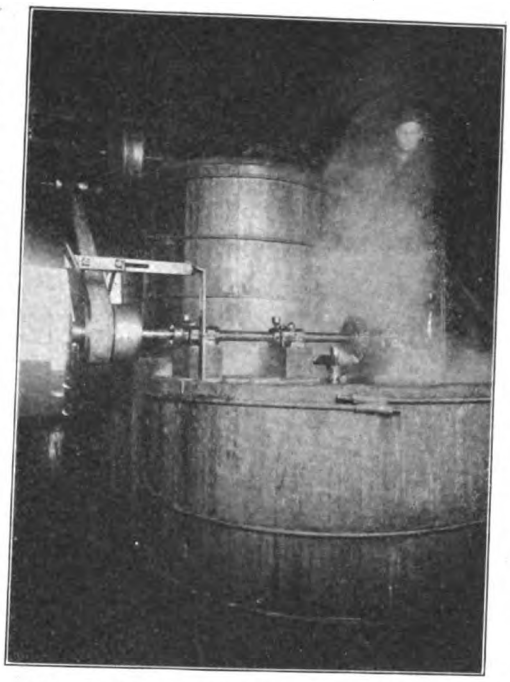


Fig. 6. A color mixing vat, where belts must withstand acid fumes and vapors.

The accompanying photographs serve to demonstrate conclusively what happens to various types of belting when called upon to operate under conditions that are disastrous to the materials from which they are manufactured. They prove beyond a doubt that scientific methods of belting selection are necessary if transmission costs are to be kept down and maximum production maintained.

Fig. 2 shows a leather belt of one of the most expensive and highest grade re-tan types—one that will increase production and lower belting costs when in its right place, but owing to service under the action of strong acid fumes it fell from the pulleys in six days, being literally burnt to a crisp. This condition did not happen all at once—it took six days; therefore, in addition to the loss of the belt, production had suffered during the period, because when a belt begins to deteriorate it cannot deliver its rated power.

Fig. 3 shows a very efficient

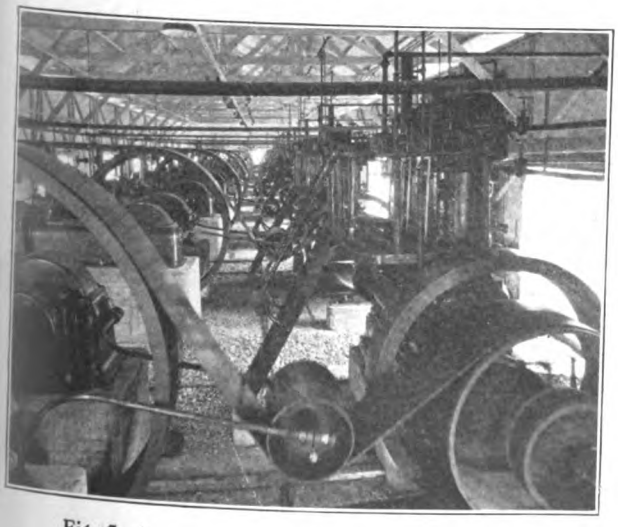


Fig. 7. An installation of gas compressors in California, driven by gas engines. Note the good layout.

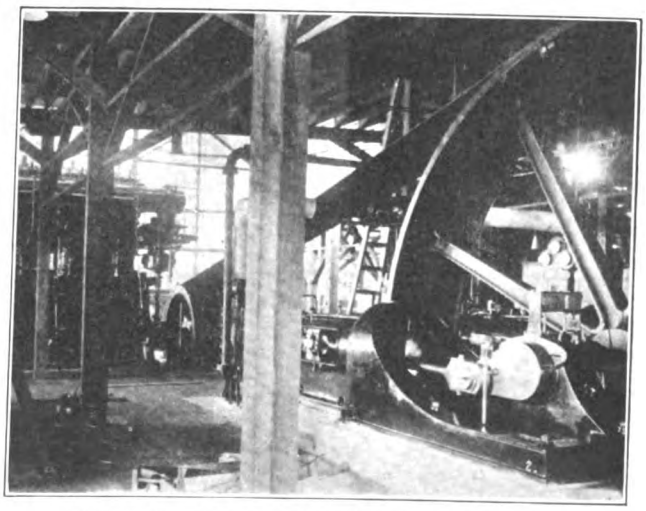


Fig. 8. It pays to **guard against getting lubricating oil on a belt, both to prevent slippage and to avoid chemical action.**

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Yours very truly,

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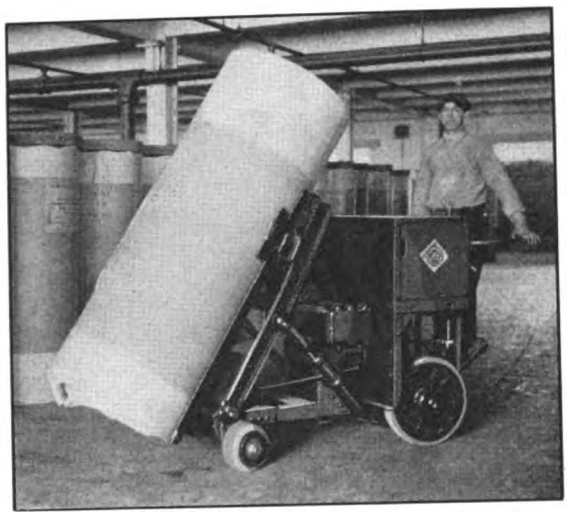


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Request Bulletin No. 40



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type of ply and frictioned fabric belt which when operating under favorable conditions will transmit its rated power, but when it is placed in a service that is disastrous to its constituents, through lack of knowledge and because a belt is just a belt, it goes to pieces in thirty to forty days as shown by the cut. The belt knows when it is in the wrong place, it cannot grumble, it cannot complain, but watch how quickly it affects production.

Fig. 4 shows a splendid transmitter of power of the elastic composition solid woven type and owing to the high resistance of its fibres to the conditions under which belts shown in Fig. 2 and Fig. 3 were operating it gave 150 instead of six days' service as per Fig. 2 and 270 instead of 30 to 40 days' service as per Fig. 3. As there are no types that will last for years under the action of the corrosive elements it is obvious that a belt's value and life must be based on its length of actual resistance and power transmitting ability during this resistance. Knowledge of the conditions and their action upon belting materials was applied to the selection of belt shown in Fig. 4 with the result that it gave 25 times the life of one type and 8 times the life of the other. Can the effect of proper type on production, maintenance costs and belting life be questioned?

The belting shown and discussed in the foregoing figures was destroyed because of misapplication in the fumes of the corrosive elements, but this is only one of the conditions where misapplication is prevalent. There are belt-killing drives by the score in almost all manufacturing plants of the country, where belt life is short and maintenance high owing to the wrong type being used. Fig. 5 illustrates the tortures some belts must undergo and where the very best is the cheapest. This drive is a hot saw and contains practically all the transmission diseases known—viz. high speed, small pulleys, short centers, shock load, tight belt, grit and intense heat. Continuous belting service here is demanded—without it, the result is obvious.

THE invention of a device which makes it possible to cook and bake with the heat of ordinary electric light bulbs is announced in a statement made public by Arthur Williams, Vice-President-Commercial Relations, of the New York Edison Company. The new cooking device will be shown for the first time at the eighteenth annual Electrical and Industrial Exposition to be held in the Grand Central Palace October 14 to 24.

Three entire floors of the Grand Central Palace will be required to show the new models of electrical equipment already known to the public and for electrical devices invented or perfected within the last year.

The greatest progress apparently has been made in the development of electrical household equipment. Arrangements have been made for the showing of forty different electrical refrigerators and for twenty different kinds of electrical household tools; this in addition to an almost endless variety of electrical washing machines, vacuum cleaners, ironing machines and the other familiar electrical household apparatus. Approximately 20,000 electrical appliances and devices will be exhibited at this year's electrical show, which is far in excess of any previous exhibition in New York or elsewhere in America.

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Capture Those B. T. U.'s While You May

Don't Feed Your Boiler Cold Water

By Francis Juraschek

IT is safe to say that the escape of available heat units in the average power plant accounts for an avoidable annual loss of millions of dollars to the manufacturers of America. And one of the most prolific sources of this waste of money is measured by the temperature condition of the boiler feed water.

Many well-informed people suppose a steam boiler is designed to heat cold water and to make steam, but actually any boiler has enough to do in changing *hot* water into steam without shouldering an added duty for which it is but poorly adapted.

Consider this primary power source—the boiler—as a manufacturing plant. It takes a raw product, water, and converts it into a useful finished product, steam. That is its sole function. It should not be required to prepare the raw product for manufacture.

Yet, wherever a boiler is made to heat water to steam-making temperatures, and then convert it into steam, it does two jobs—and one of these jobs is not a natural, proper function, but an unfair added burden.

The work of changing water at a given temperature into steam *at the same temperature* requires the expenditure of a most surprising amount of heat. Every school child learns at some time or another that water boils at 212° F. The natural assumption is that steam results.

This is perfectly true, *at atmospheric pressure*. But steam at atmospheric pressure will do precious little work. And even at atmospheric pressure it takes five times the amount of heat to convert water at 212° F. into steam, as it does to raise the temperature of the water from zero to the boiling point.

To generate steam at 175 lb. pressure (a fair average boiler pressure) requires a great deal more heat than is necessary at atmospheric pressure. Water behaves in a very curious manner when bottled up and subjected to heat. Instead of turning to steam at the boiling point, it remains water. And if your bottle were

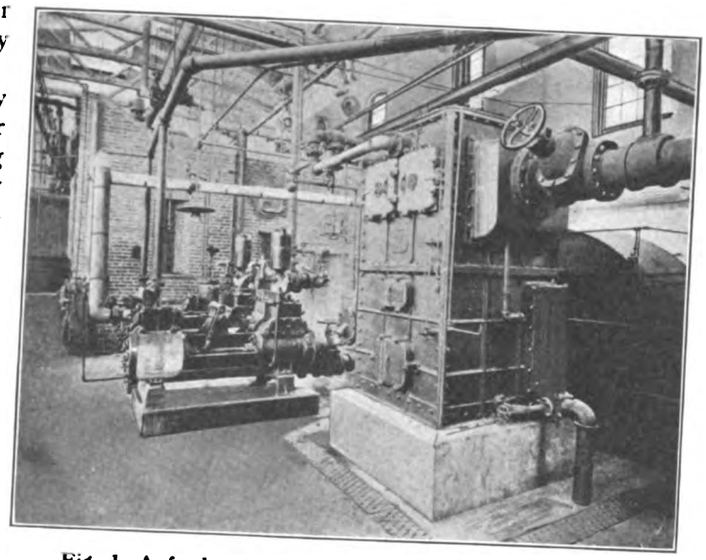


Fig. 1. A feed water heater installation at the plant of the Nixon Paper Company.

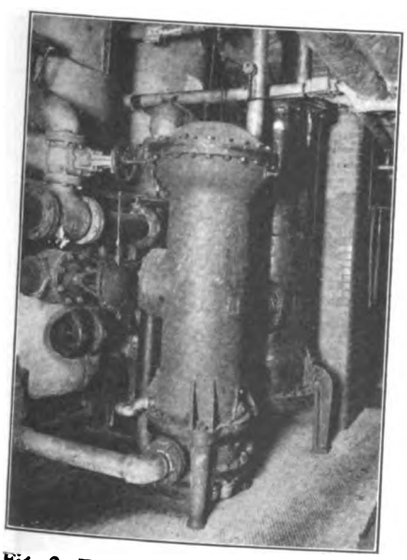


Fig. 2. Wainwright closed type feed water heater as installed for service in a large hotel.

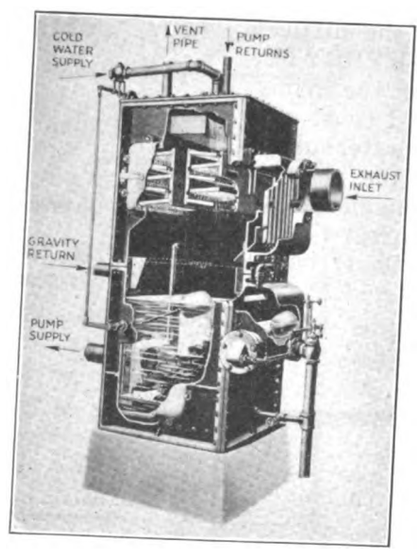


Fig. 3. Phantom view of Cochrane open feed water heater, showing typical method of bringing exhaust steam in contact with feed water.

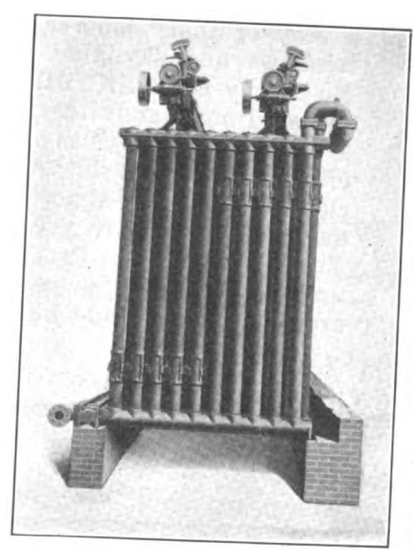


Fig. 4. A typical economizer unit, built for high pressure, with all joints metal-to-metal.

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Dirty GLASS (a 2 years' accumulation of grime). ½ of 1 foot-candle illumination. Even with 14 electric lamps, only 2 foot-candles (on a bright day). (This photo required an 18 minute exposure).



CLEAN GLASS (cleaned with SKYBRYTE). No artificial light, 38 foot-candle illumination—19 times more! (This photo required less than 1 second exposure)

SKYBRYTE Made this Astonishing Difference

Flooding this Dark Interior with Daylight

THE vivid difference between these two contrasting photographs of the Conveyor Chipping Room at The OTIS STEEL CO., Cleveland, O. (Lakeside Plant) is a more eloquent sales argument for SKYBRYTE than anything we could say.

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Thousands of foundries and mills — great manufacturing plants — railroad shops and roundhouses —now keep glass clean with SKYBRYTE —the National Glass Cleaner. And regardless of how badly it is encrusted with rust, soot or carbon scale!

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Any ordinary laborer cleans the dirtiest windows and skylights with SKYBRYTE. He simply coats SKYBRYTE on the grimy glass. Immediately the hardened crust dissolves. Then he flushes off with water, using either hose or brush. At once the glass is clear and clean—almost like magic. The daylight streams in. Workers feel better. The curve on your Production Chart bends upward sharply. Spoilage and accidents decrease. Electric light bills promptly drop.

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Paint, putty and sash are not damaged in the least. This efficient cleaner is absolutely safe to use under all conditions. And always effective.

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The average total cost of cleaning with SKYBRYTE is less than ¾c. per square foot. This includes both labor and material. Five gallons of SKYBRYTE cleans 4,000 square feet of dirty glass. An unskilled laborer cleans 5,000 square feet per day. And this trifling cost is many times offset by the other savings it effects for you.

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There is one sure way to convince the most skeptical. It is by actual demonstration. Thus we make you the trial offer herewith. It is your opportunity to try SKYBRYTE entirely at our risk—in your own plant. Fill out the coupon below.

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Gentlemen: You may ship us 5 gallons of Skybryte on trial and one regular 75c Skybryte Brush FREE. We will use enough to make a thorough trial — enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for 5 gallons Skybryte at $3.00 per gallon. F. O. B. Cleveland. Skybryte in bbls. $2.50 per gallon freight allowed.

Company .....

Street .....

City .....

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sufficiently strong and securely sealed to withstand the pressure, steam would never form, no matter what the temperature might run up to.

In other words, the higher the temperature, the greater the pressure; and the greater the pressure the higher the temperature at which water turns into steam.

For example; the temperature of steam at 175 lb. pressure is 378° F., and it requires approximately 847 heat units to change water at 378° F. into steam at the same temperature —over eight times the amount of heat needed to raise the temperature of the same water 100°, and nearly three times that required to raise it from normal (70° F.) up to the boiling point.

Feeding cold water to a boiler adds roughly 33% to its load. That means an opportunity exists for increasing the boiler efficiency 25% if we can merely limit it to its proper function —which is simply making steam.

It may be stated as a general rule that coal consumption is decreased 1% and boiler capacity increased by the same amount for each 11° F. the feed water is heated before delivery to the boiler.

British thermal units, the standard of heat measurement, are gold dollars to the manufacturer, and British thermal units, not steam, really furnish the power that drives the engines, pumps and compressors. Steam is but the storehouse of heat energy.

But how much does it cost to heat feed water? And what is the difference whether the water is heated in the boiler, or in some special form of heating apparatus? All the difference in the world.

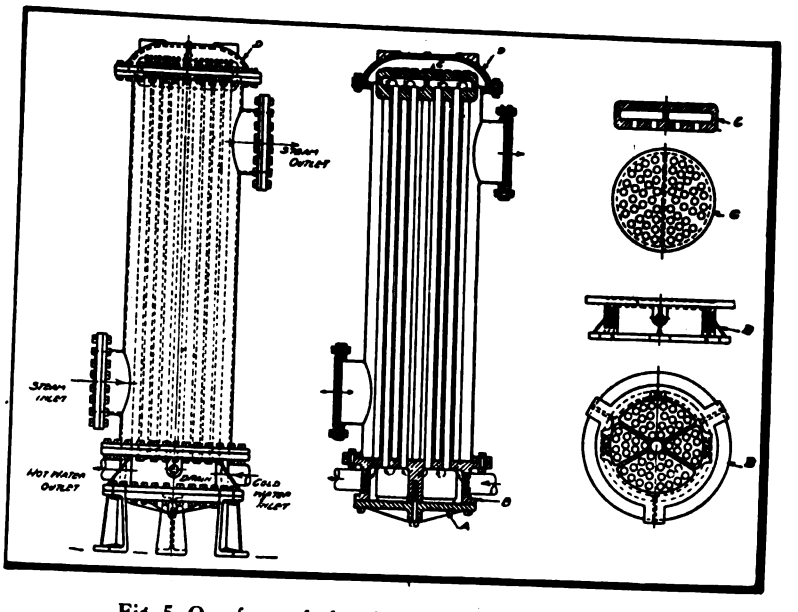


Fig. 5. One form of closed feed water heater, showing circulation of steam in the shell surrounding the system of closed tubes carrying boiler feed water.

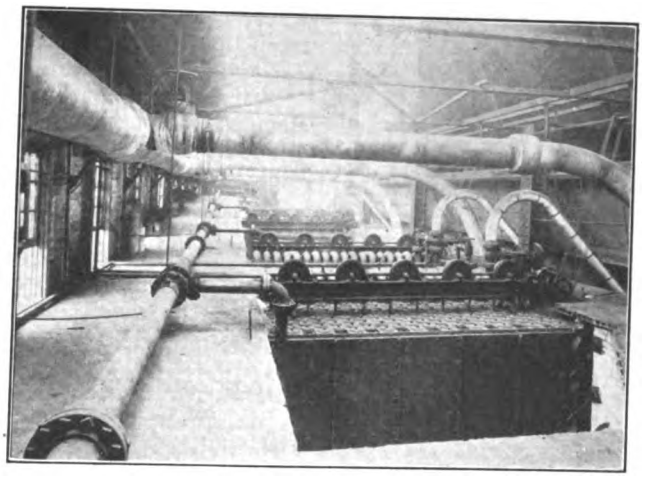


Fig. 6. Four Sturtevant economizers operating in connection with six 600 hp. boilers served by underfeed stokers.

The making of steam entails a waste of heat through the flues and up the chimney. Steam utilization entails a waste of heat in the engine exhaust.

These two wastes are the fuel which the feed water heater uses. It is obvious, then, that if we use these wastes, we shall save money. This is exactly what happens. Feed water heaters make feed water profits from power plant wastes.

There are three general types of feed water heating equipment:

1. "Feed water heaters" which utilize the waste heat in exhaust steam.
2. "Economizers" which utilize the waste heat of flue gases.
3. "Steam traps" which collect the hot water condensed from steam in the heating lines throughout the plant.

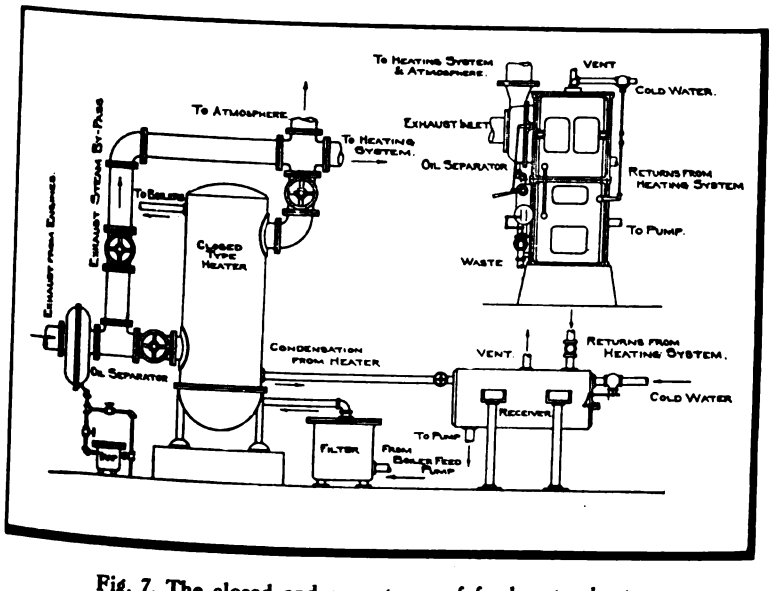


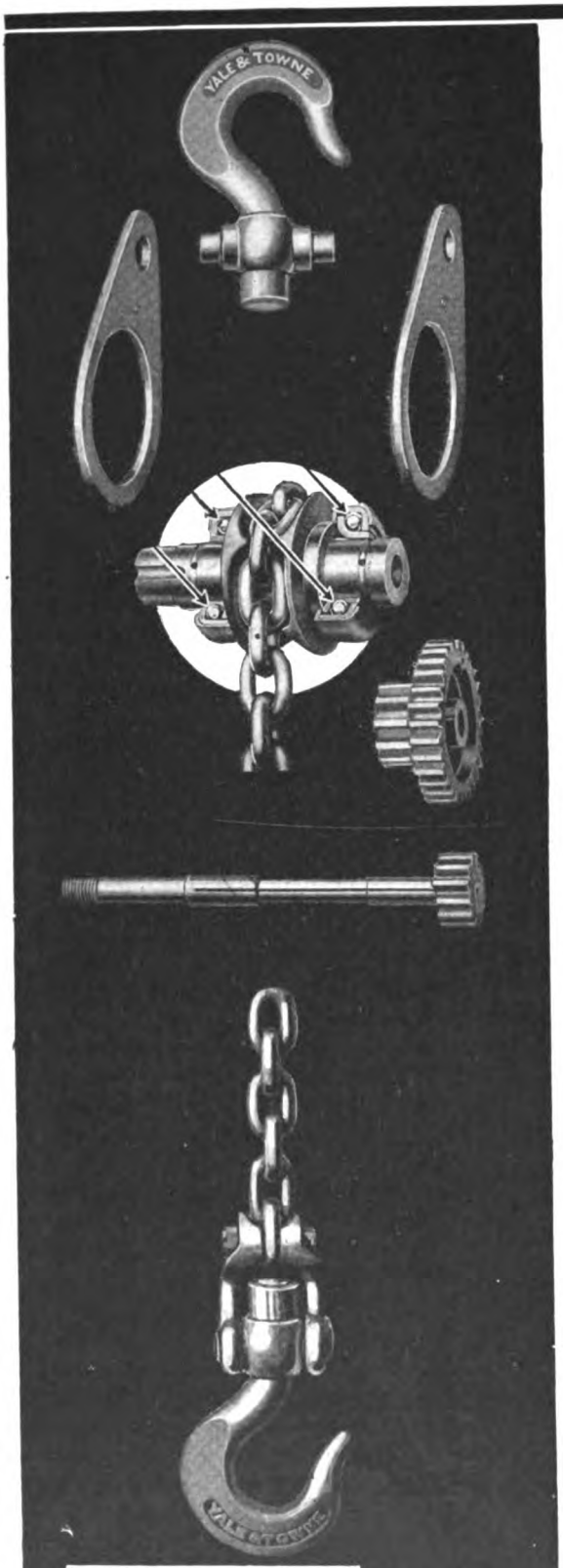
Fig. 7. The closed and open types of feed water heaters, with their respective connections.

Feed water heaters are of two general types —(a) open heaters and (b) closed heaters. In the open type, the exhaust steam and the water are brought into intimate contact by spraying the water through the steam. In the closed type, the water either passes through a series of small tubes surrounded by steam (this is, perhaps the more usual form), or the steam is exhausted through the tubes to heat water contained in the enclosing shell, or tank.

Economizers are in reality closed feed water heaters which utilize the waste heat of flue gases instead of exhaust steam. Feed water heaters and economizers work together for

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Steel suspension parts are of vital importance in the life of a chain block, increasing its durability and safety.

Here are the parts of the Yale Ball Bearing Spur-Geared Block which constitute "A Line of Steel."

Steel Safety Hook and Crosshead
Both are steel forgings designed to swivel and rock.

Steel Suspension Plates
These take the shocks and carry the load at this main point of support.

Steel Load Sheave
Accurately shaped pockets to fit the steel links of the load chain, with provision for positive lubrication. Internal bearings, bronze bushed.

Steel Ball Bearings
High carbon chrome alloy steel ball bearings, comprising sixteen or more steel balls, support each side of the steel load sheave, where friction is greatest.

Steel Gear and Pinion
A one-piece gear cut out from solid steel with Bronze-bushed bearings.

Steel Driving Pinion
A one-piece forging of special steel to resist extraordinary twisting and bending. Heat treated and ground to a diameter.

Steel Load Chains
Die-formed and electrically welded smoothly finished links. The chain is heat-treated to toughen it and lengthen its life and insure uniform strength throughout.

Steel Detachable Shackle and Steel Hook
No welding necessary when renewing or when equipping with extra long chain.

Every notable improvement in Chain Block Construction for the past 50 years has been made by Yale. Yale is the originator.

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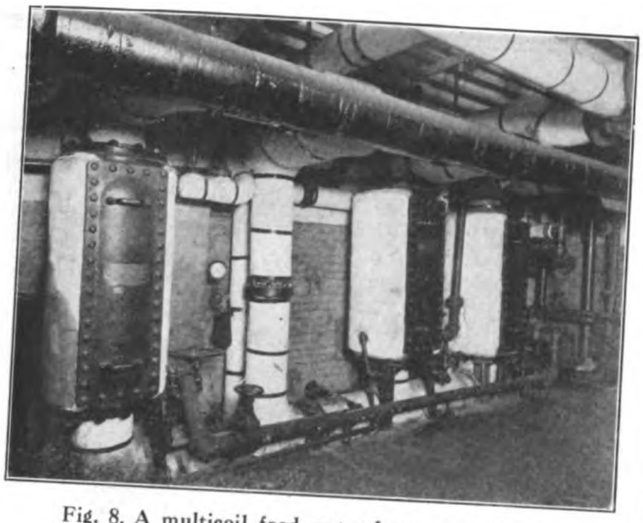


Fig. 8. A multicoil feed water heater installation of exceptionally neat appearance.

maximum efficiency in the production of steam.

Steam traps are only practicable as a source of boiler feed when exhaust steam is used for heating buildings, or the vats, mixers, evaporators and other equipment used in the process industries.

When it is considered that approximately 25% of the heat energy consumed in making steam is required simply to raise the temperature of the water, it is apparent that one of the first places where substantial power plant economies may be effected is in the utilization of waste heat to preheat the boiler feed water.

In practice, it is often advantageous to install both feed water heaters and economizers on the same feed water circuit.

When this is done the feed water heaters, taking exhaust steam, start the heat saving process and the economizers then take over the job and still further boost the feed water temperature to as nearly as possible the boiling point at the operating pressure of the plant.

Simple as it may seem, however, to suggest arbitrarily that both economizers and feed water heaters are obvious money-savers, the actual decision as to whether either or both should be used, and how, is the problem for an experienced power plant engineer.

For instance, if it so happens that exhaust steam is used for heating the plant in winter, that plant then is already utilizing a power plant waste to good advantage and in the process of utilization is developing a by-product that is just as valuable as the product of a regular heater.

In all steam lines there is condensation and this "condensate" furnishes ideal boiler water—purified and preheated. The business of trapping this by-product and putting it to work is a profitable move. This applies also to plants which use exhaust or live steam for heating vats, mixers, agitators or other "processing" equipment.

Steam traps, under such conditions, take the place of the regular feed water heaters. And steam traps, also, may act as the preliminary step with economizers completing the work of waste heat utilization.

Most manufacturers will find, as a matter of fact, that the manufacture of feed water is one of the most profitable lines of business in which they could engage. Every industrial executive is interested in possible hidden profits. If heat were as visible as steam, many a factory chimney would tell the same story of lost profits.



Each Stock Room Is Different

EACH industry, and each stock room in each industry, has some storage problem that is distinctively individual to it. The articles stored may be of odd shapes and sizes, of varying quantities or the stockroom may be arranged in some different fashion.

Yet, for each stock room there is a practical method for reducing the time of finding, simplifying stock accounting, and preventing shortages and over stocking with a system of Durand Steel Racks, Bins and Shelving.

Durand storage units are standardized. They can be interchanged and rearranged with no great effort.

They are built entirely of steel. They incur no high repair, replacement or upkeep charges.

They form the basis for a permanent storing-finding system, that not only meets present storage needs but can be changed to handle those of the future.

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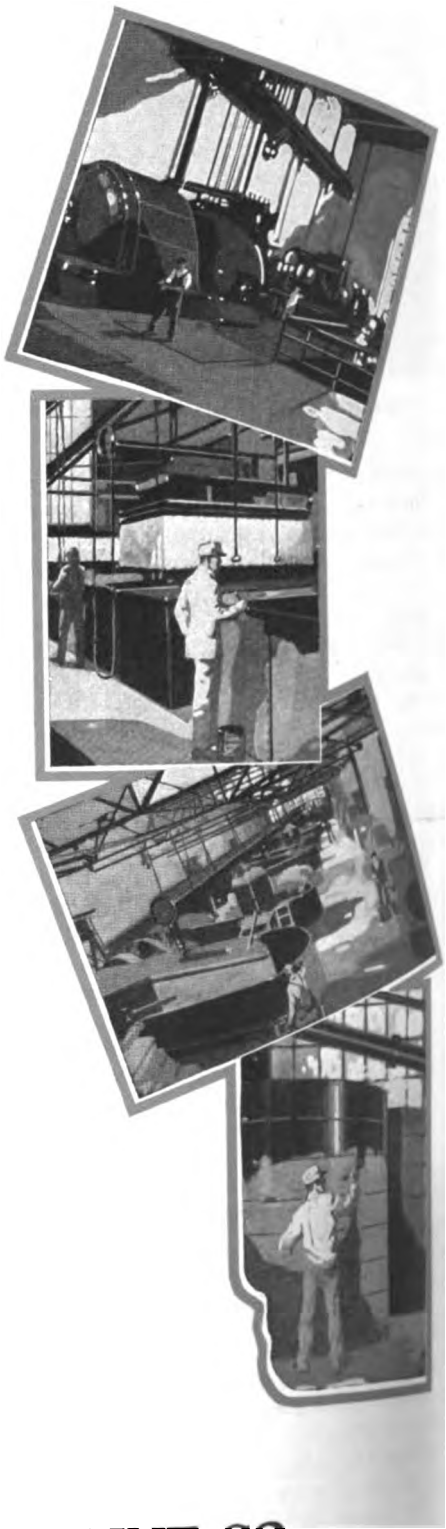
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¶ Experience has taught them to use it where conditions would rapidly break down ordinary paint.

¶ VALDURA *is* a different paint. It is a paint made to satisfy you no matter what the conditions are. It is made to preserve—to last. Only those ingredients which time and exhaustive tests have proved correct and to be the best are used in its manufacture. Genuine 99.5% pure Gilsonite *natural* asphalt forms the base.

¶ You can't go wrong in specifying VALDURA. It must make good, or we will!

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Moving Caravans of Industry

Manufacturers Trek to New Locations and Lower Costs

By John A. Piquet

HIGH up on the flowered slopes of the glistening Alps cows of lordly mien are driven each spring so that the world's finest chocolate and cheeses may eventually be produced from the scented creamy product of this combination of producing animal and perfect location.

Indispensable Rubber of a thousand uses may not be grown at every spot. Certain soils and climates must be present before paying plantations abound, and the locations of these combinations of temperature and soil are carefully sought and guarded.

The sciences of the soil are old, and the location of human effort at the strategic—the only—spots, has been worked out. Now it is seen that industry is but little different from agriculture and that its success depends not only on men and manufacturing formulas, but also upon the centering of activity in those places on the world's broad surface where the best craftsman, materials, and motive power may be assembled and from which products may be expeditiously distributed.

Even the manufacture of the humble shoe-polish has a science of its own as deadly accurate as the growth of the rubber-tree. But two short years ago, in a fair city of the Middle West, operated the Chieftain Manufacturing Company, makers of shoe polishes, dressings, and dyes. A study of their production problems brought out the fact that their heavy material came from the East, and that for necessary quick and constant distribution of small light package goods, their location was poorly suited. They therefore decided to locate in an Eastern seaboard city, of which five were carefully surveyed. Baltimore was chosen because it was found that transportation to interior points was cheaper than from other port cities, and that congestion of traffic or embargoes were not present in this city, thus ensuring prompt shipment to myriad customers.

The real problem was to move all equipment, personnel, etc., without disturbing deliveries or losing



Fig. 1. This modern plant is the result of the experience of six gin machinery concerns who united, but kept individual production in each of the six plants. Their experience convinced them large-scale production in one great factory was the better way, so their new location was made.



Fig. 2. The spacious final assembly building of the Continental Gin Company, with wood block floor, unit heaters, and toilet in monitor.

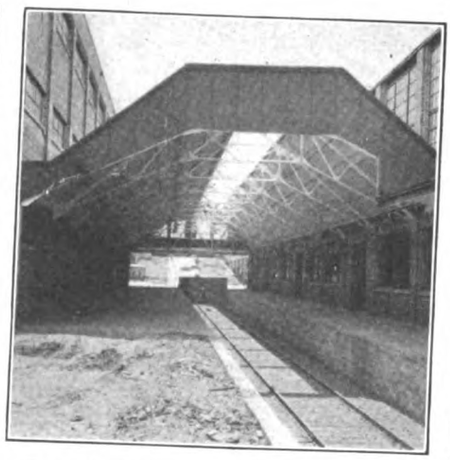
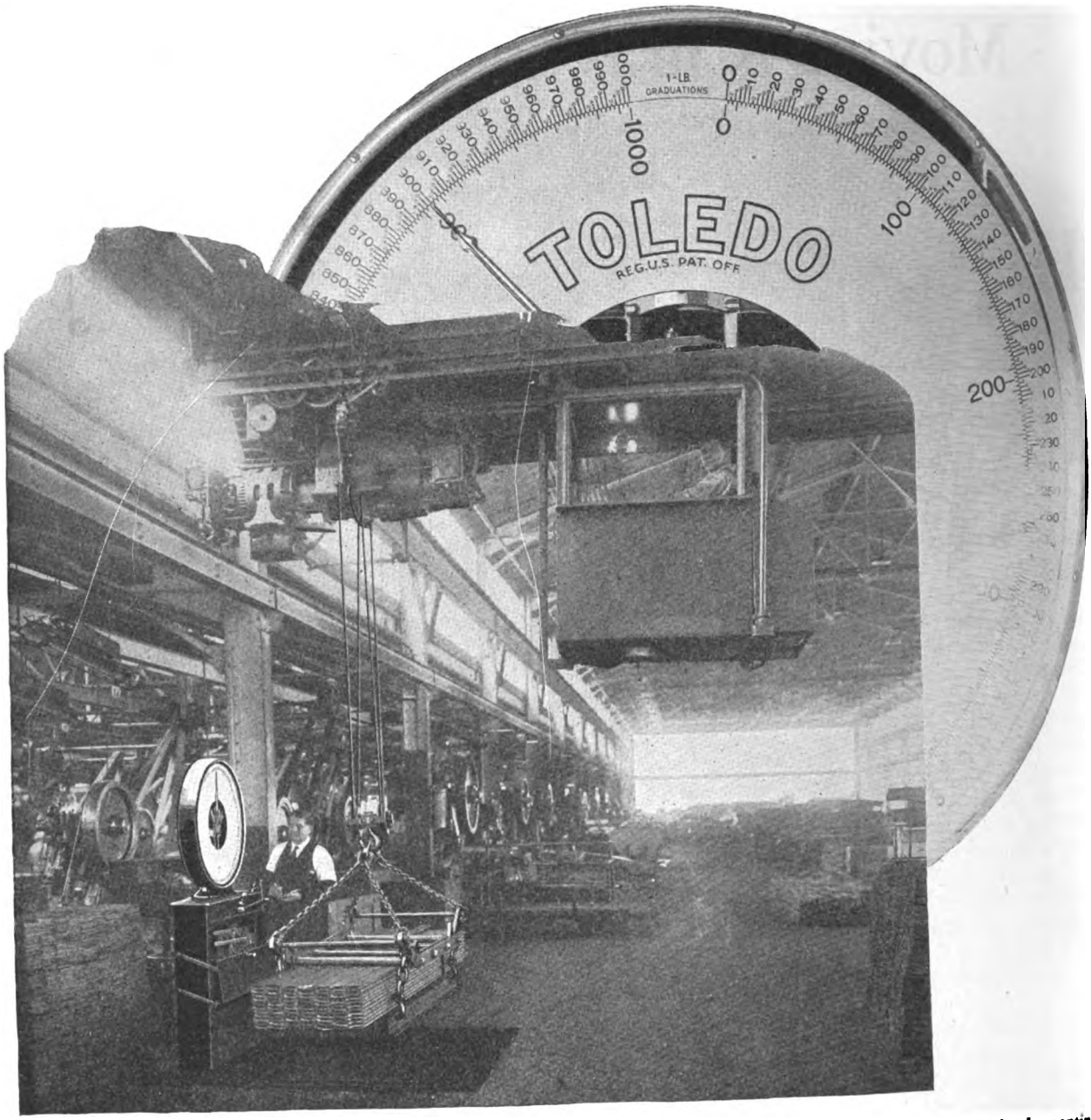


Fig. 3. Modern shipping facilities, available in all kinds of weather, at the Continental Gin Company.



Fig. 4. While equipment of the six small plants, which are to be superseded by this large central plant of the Continental Gin Company, is being moved, new machinery is being installed. New machine tools in the heavy machine shop.

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THE Toledo conception of an adequate industrial weighing service comprehends even more than a reliable scale that instantly and automatically indicates on a great dial the weight or count of whatever is placed on the platform.

Subjected to more exacting requirements than any other device used in business, the scale must measure accurately the very power that operates it, which is the weight of the materials placed upon it.

The responsibility of this company, therefore, is to deliver to the user not only a properly designed, well engineered, and ruggedly built scale, but also the ultimate product of the scale, which is the continuously accurate automatic measurement of materials.

To insure this, the Toledo Scale Company provides facilities for scale maintenance never before equalled, through a permanent organization of skilled and accredited scale mechanics in 106 cities in the United States and Canada.

On agreement the entire scale equipment of thousands of manufacturers and merchants is given systematic and periodic inspection. This arrangement is simple, economical, and satisfying.

Toledo Scale Company, Toledo, Ohio

Canadian Toledo Scale Company, Limited, Windsor, Ont.

Manufacturers of Automatic Scales for Every Purpose

Service Stations in 106 Cities in the United States and Canada

TOLEDO SCALES

NO SP[illegible]GS HONEST WEIGHT

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Fig. 5. By relocating from Louisiana to Savannah, the Savannah Sugar Refining Company entered a better market, and built a modern plant for a better product.



Fig. 6. The modern interior of the Savannah Sugar Refining Company was the result of relocating, and building and starting anew.



Fig. 7. In relocating its plant, the Savannah Sugar Refining Company established itself on the Savannah River, obtaining water shipment and water supply.

accounts. A period between busy seasons was selected for the moving dates. Notice was given the various departments to manufacture and store enough products to meet sales demands for a period of sixty days. After this, manufacture was discontinued in the old plant, all machinery dismantled, and moved by fast freight to Baltimore.

During this period new stocks of raw material, and printed matter used on the products, were delivered at the new plant, while the old one kept on filling orders as planned. When the new plant was ready for operation, the residue of the manufactured stock, office equipment, etc., were shipped to the new location.

The executive heads arrived with the last shipment. A clerical force was soon obtained from workers living near the plant. Labor was recruited gradually and carefully trained. Within less than three months from start of moving, the Baltimore plant was operating to full capacity, and no friction in production or sales deliveries had resulted.

The removal of the Cornell Iron Works, Inc., makers of rolling steel shutters and doors, from Manhattan to the open nearby areas of Long Island City is a typical city to suburbs relocation. This concern was in a three-story building in New York, and was compelled to use cranes and hoists to lift material from one floor to another. For lack of yard space, they were not able to manufacture and store in advance, thus being unable to fill rush orders from stock.

In Long Island City they would still be near New York, in fact within its legal boundaries and connected by bridge, tunnel and rail, within thirty minutes or less. Their main purpose was to have all operations on one floor, including the office. This was achieved. The necessary yard space was secured.

No time in production or sales arrangements was lost while moving. They moved by truck, one operation at a time. Some men were taken off other operations, and the augmented force speeded up the first operation to be moved. This was then transported to the new location. Meanwhile the next operation was being speeded up, and so on. The move was made at the slackest time possible.

The only obstacle in the new location was a necessary change from direct to alternating current. Each motor on each machine had to be adjusted, and a transformer installed.

An interesting relocation is the result of a merger in the case

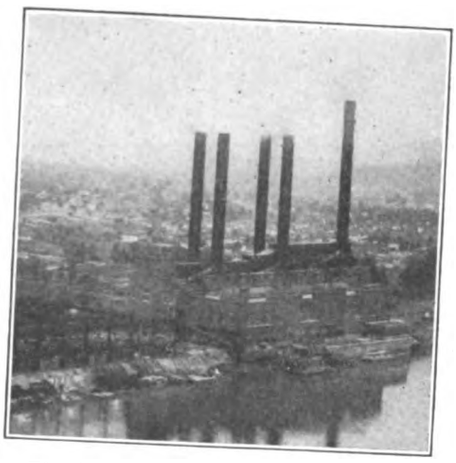


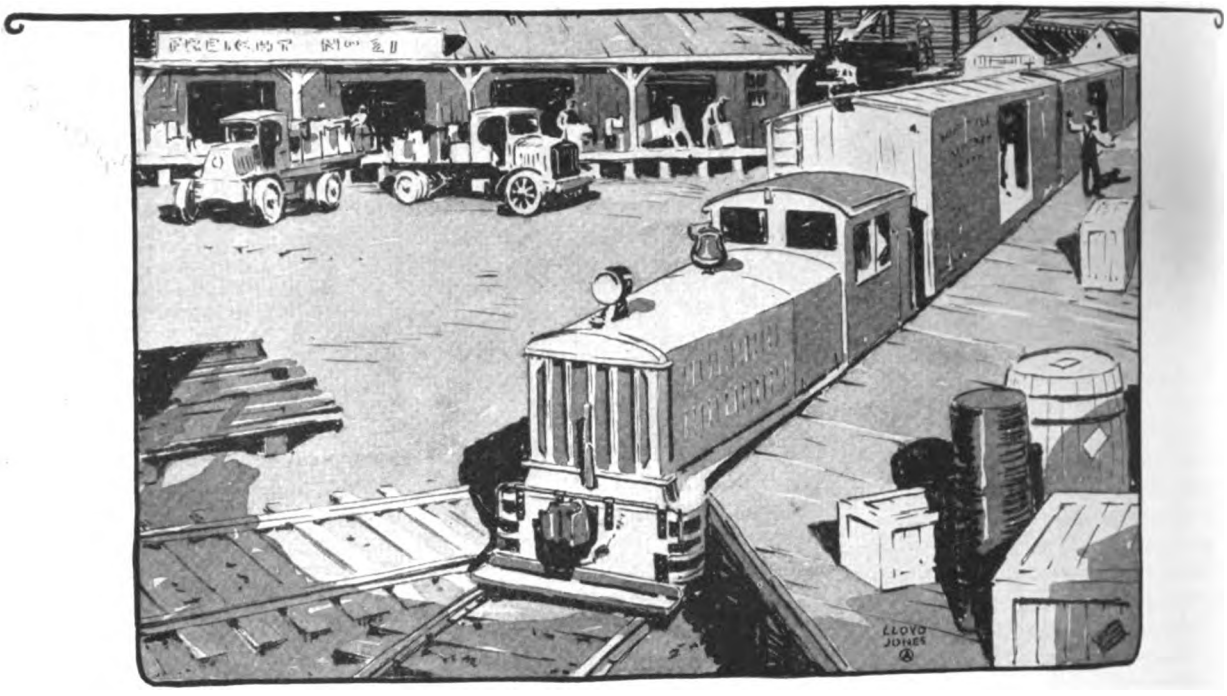
Fig. 8. The decentralization of industry from crowded centers increases as power becomes more available everywhere. This central power station near Pittsburgh will eventually give way to coal burnt at the mines, and power obtained from the river in foreground.



Fig. 9. The one industry that relocates too much. A modern Mississippi lumber plant. The lumber industry uses up its forest areas, and then moves on. The tendency now, however, is reforestation and less relocation.

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What Does a Locomotive Cost?



ASK a dozen men to estimate the cost of an industrial locomotive and eleven of them will guess two or three times too high.

That locomotives are expensive is a prevalent idea—even you, perhaps, would not guess their price accurately.

You will be surprised, then, to learn that certain sizes of Davenport gasoline locomotives cost less than a large sized automobile truck. But, it's a fact.

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Fig. 10. Cheaper land in the suburbs and wholesale construction means low-cost housing for workers. The Metropolitan Life Insurance Company built this development at Woodside, L. I., near Long Island City.

of the Continental Gin Co. of Birmingham. Six companies with as many plants, extending from Texas to Connecticut, merged for unified sales and management. Individual production by each plant was maintained. This, however, gave way to large-scale low-cost production in one modern new and enormous plant at Birmingham, to which all equipment of the six plants is now being moved.

Radical changes for the better are illustrated in the relocation of the Savannah Sugar Refining Company from Western Louisiana to Savannah, Ga. When you relocate, it is safer to consult experts. Westinghouse-Church-Kerr, now Dwight P. Robinson & Co., were asked to coöperate with the owner in moving and building a plant.

The decision to move was made by all parties only after it was seen that the Louisiana location necessitated two handlings of the incoming raw sugar before it entered the mill, while the latter was also located in a highly competitive region, with two refineries nearby at New Orleans. The capacity of the mill, and its equip-

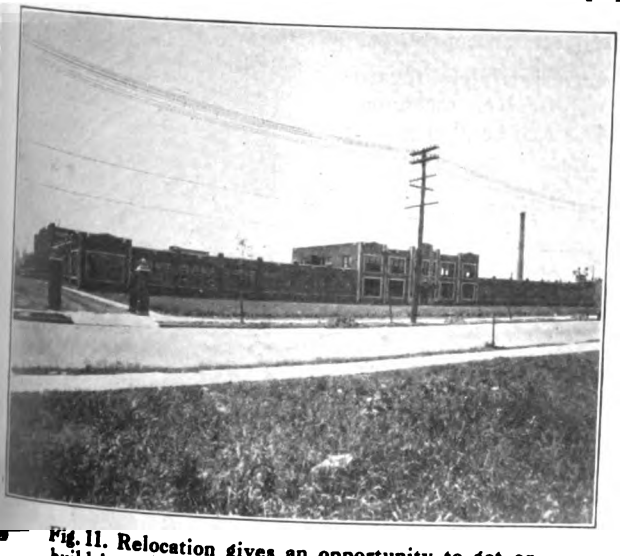
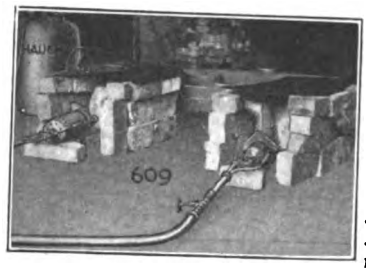


Fig. 11. Relocation gives an opportunity to get or build better quarters. The American Lithograph Co., moving to Buffalo for better distribution and labor conditions, built this thoroughly modern plant.

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"A Means To Economy"

For Foundries, Boiler, Machine Shops and General Industrial Purposes



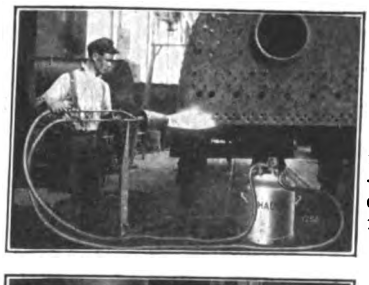
For PREHEATING in connection with welding use Hauck Kerosene Torches, and reduce the fuel cost by 50%. The steady, mild heat insures perfect welds.



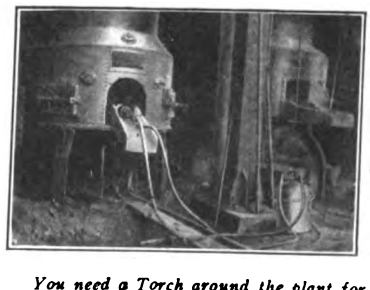
In PIPE SHOPS—Hauck Kerosene or fuel oil torches are used for pipe bending, flanging and shaping, annealing copper pipes, brazing cup joints, etc., and save time, labor and fuel.



In MACHINE SHOPS—for expanding or shrinking of wheels, discs, etc., melting babbitt out of bearings, re-babbitting, etc., Hauck Torches are necessary. The time saved on one job often pays for the torch.



In BOILER SHOPS—Hauck Torches are used for setting up bags, laying up corners and laps, straightening plates and distorted rings, flanging, dishing, etc. —For riveting use our fuel oil burning rivet heating forges.

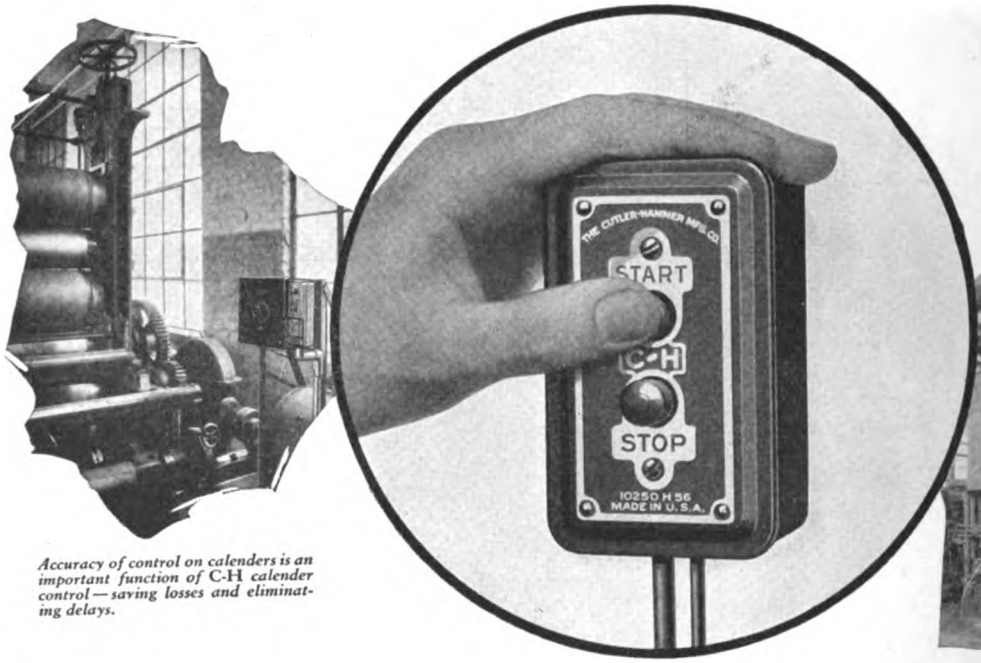


In FOUNDRIES you can save time, fuel and labor when using Hauck Torches for cupola lighting, mold drying and ladle heating.

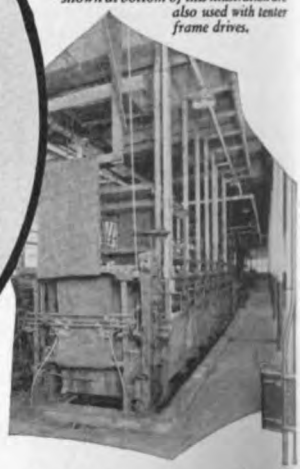
You need a Torch around the plant for a quick heat when you want it and where you want it. We have what you require—25 types and sizes to choose from—every one dependable and made to give satisfactory service for years. Send for bulletin No. 112. If you state your requirements, we will recommend the best size.

Hauck Manufacturing Co.
148 Tenth Street, Brooklyn, N. Y.
HAUCK HIGH AND LOW PRESSURE OIL BURNERS

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Accuracy of control on calenders is an important function of C-H calender control—saving losses and eliminating delays.



Enclosed Drum Type Speed Controllers shown at bottom of this illustration are also used with tenter frame drives.

What Cutler-Hammer Electrical Control Means to All Industry



C-H 9141 Auto-Transformer Starters for squirrel-cage motors, are made in sizes from 5 to 200 hp. for use in 110 to 2200 volt systems.



The new C-H 'X' Starters are for the automatic starting of single phase and polyphase motors that may be thrown across the line.

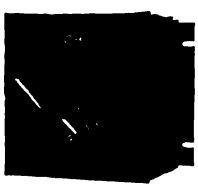
Greater Output Per Machine Per Man Safety to Workmen

MOTORS are valuable to you only to the extent to which their power can be controlled.

Whether the duty of the motor is a simple one requiring but infrequent starting and no speed regulation—or a duty which demands precise control through a cycle of operations with ability to secure speed variations—there is a Cutler-Hammer Motor Starter or Controller to insure the greatest operating effectiveness and satisfactory performance.

C-H engineers have spent 30 years work pioneering and developing motor control equipment—the "C-H" trademark being known the world over—wherever electric motors are used.

It will pay you to specify Cutler-Hammer Controllers, regardless of the make or type of motors, or motor-driven machinery you are installing. The nearest branch office will be glad to give you detailed information.



C-H Hand Operated Motor Starting and Speed Regulating Rheostats are also furnished completely enclosed with operating handle outside.



C-H Automatic Pre-Set Controllers used extensively on tenter frame drives give push button control with speed adjustment feature. Also furnished completely enclosed.

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ment, were such that slightly off-color sugar was produced, selling a cent or two off the market, and full use of nearby cane fields, as well as incoming material, was not possible.

The Southeastern states were found to offer the best field for a new sugar refinery. At Savannah, sugar could be brought by ship directly to the mill site. Rail distribution facilities to the interior were good. The old mill was taken down and as much shipped as possible. A new modern mill turning out high-grade sugar was built, and a really new industry with an improved product was born.

The use by a dye manufacturer of another kind of export, the Technical Service Company of New York, engineering industrial real estate men, resulted in a waste product becoming a source of profit. This waste contained a considerable percentage of nitric acid. In looking for a new factory, the dye manufacturer could not find a place where this waste, as well as objectionable fumes, could be disposed of with safety in sewers or otherwise. Consulting this expert resulted in finding

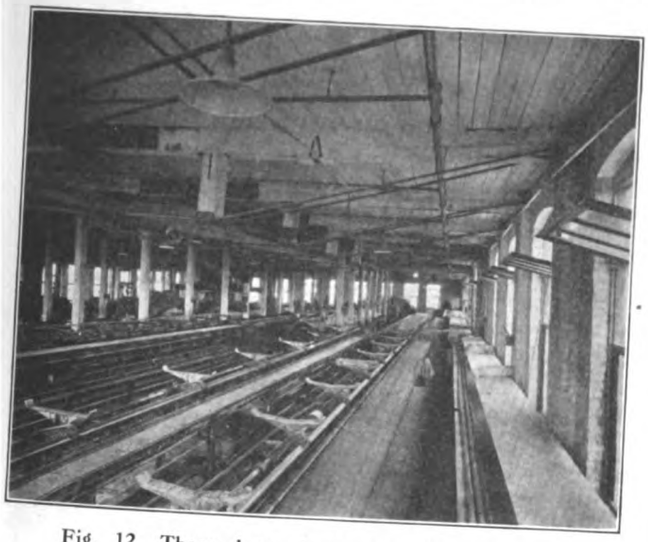


Fig. 12. These long, heavy machines of the Tucker Rubber Company, which relocated at Buffalo, were moved without trouble and were in operation before the remainder, an equal number, were taken off production.

a chemical manufacturer who could use this waste for his own product, who had sufficient room for a tenant, and who was also willing to coöperate on disposition of the objectionable fumes, of which he had some, also.

Thus we have examples of firms who have made sweeping economies and improvements by finding an entirely new setting and bedrock for their enterprises, thus clearing out at a bound numbers of handicaps and troubles that their old location possessed, and that only a new location could dispose of.

THE fall meeting of the American Welding Society will be held in Boston, Mass., on October 21, 22 and 23. Headquarters for social functions are to be at the Hotel Somerset; headquarters for technical sessions will be at the Massachusetts Institute of Technology, where exhibitions and demonstrations will be open from 9 a. m. to 5 p. m. each day of the meeting, and on Wednesday (October 21) from 7:30 p. m. to 9 p. m. A program of interest and practical value has been arranged for the meeting.



Going Up—

to bring Costs Down!

Demonstrating the ability of Chicago Automatic Conveyors to cope with the unusual in materials handling problems, take a look at this illustration.

At this plant they take coal up and over from the railroad spur to the storage pile located close to the boiler room, to bring handling costs down. A 45 ft. stationary Chicago Automatic Bucket Conveyor is used. Any other method, than a conveying system, would necessitate hand or truck carrying around the plant buildings—a slow costly process!

Perhaps you have a similar materials handling problem that's had you guessing how to solve it most efficiently and economically? Let us show you the way with Chicago Automatic Conveyors as we have shown many manufacturers. Just ask us to send our representative.

Write for this Catalog

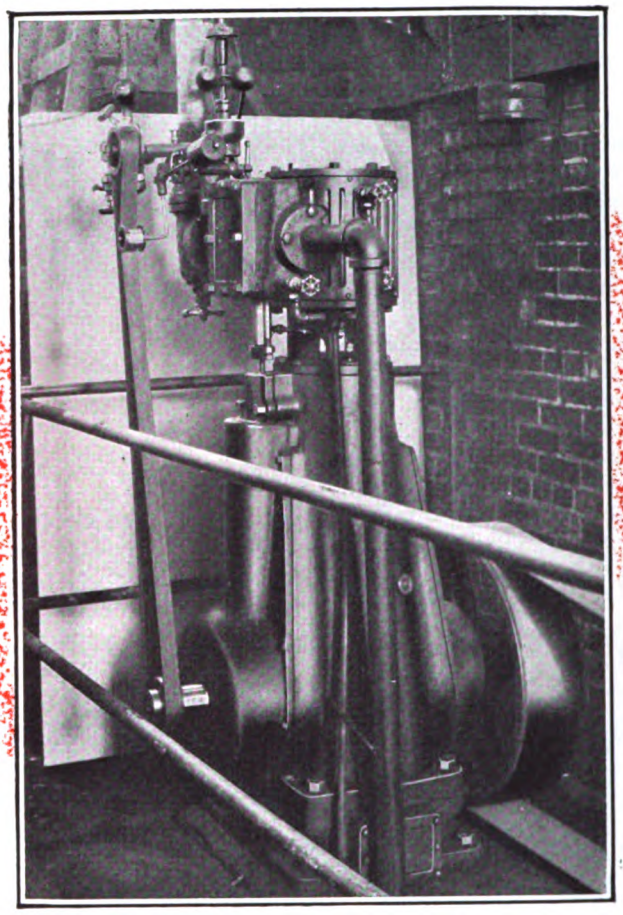
Our catalog illustrated and describes a most diversified line of automatic conveying equipment, all steel built in bucket, belt and drag types. Tear out this advertisment and put it with your correspondence to be answered immediately.



Chicago Automatic Conveyor Co.
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Chicago Ill.

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Speed Up by Slowing Down

A Glimpse of Some New Speed Reducing Mechanisms

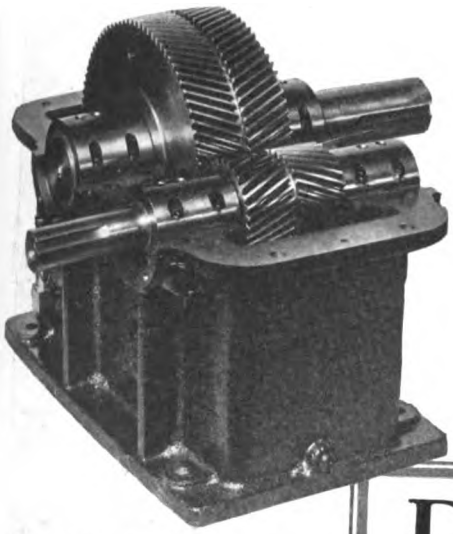
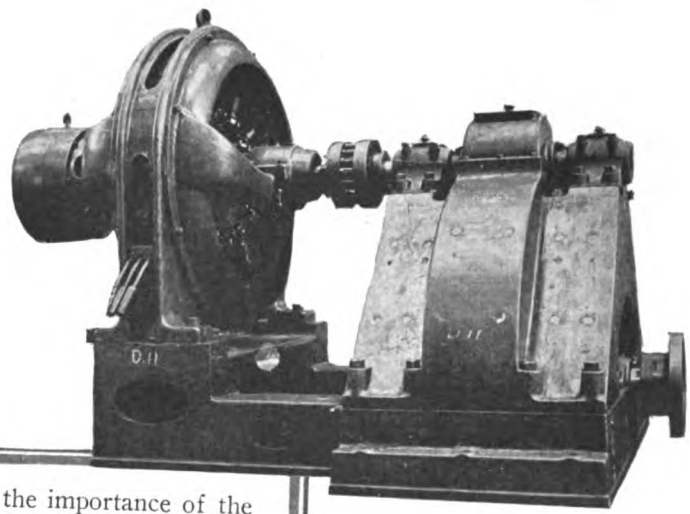


Fig. 1. The Poole Engineering & Machine Co., of Baltimore, Md., has recently brought out two new types of reduction gears. The Type "H" consists of double helical or herringbone gear and a herringbone pinion cut integral with high speed shaft. For low speed drives lubrication is by splash and gravity system, while for high speed, such as turbine drives, an oil pump and cooler is provided, to insure cool oil under pressure to gear teeth and bearings.



DAY by day the importance of the speed reducer is becoming understood and appreciated more and more by industry.

Compactness and efficiency in operation of steam turbines and electric motors dictate high rotator speeds. In the past the attempt was made to redesign many operating mechanisms to suit the high speeds of the driving units. Efficiency in operation was frequently sacrificed thereby because it was not often that the most efficient speeds of driving and driven mechanisms coincided. The coming of the speed reducer solved this problem since it permits the adoption of proper speeds for both.

Fig. 2. The Type "K," a new reduction gear also made by the Poole Engineering & Machine Co., consists of double helical or herringbone forged steel pinion integral with shaft and a cast steel double helical spur gear. Gear and pinion are lubricated by the splash system, running in an oil tight oil filled case. The high speed shaft or driving pinion in the type K gear is located in the top of the casing and the driven shaft is directly under the pinion shaft and just below or near the floor line, which makes it especially desirable for certain types of machines used in industries where the line shaft is close to the floor.

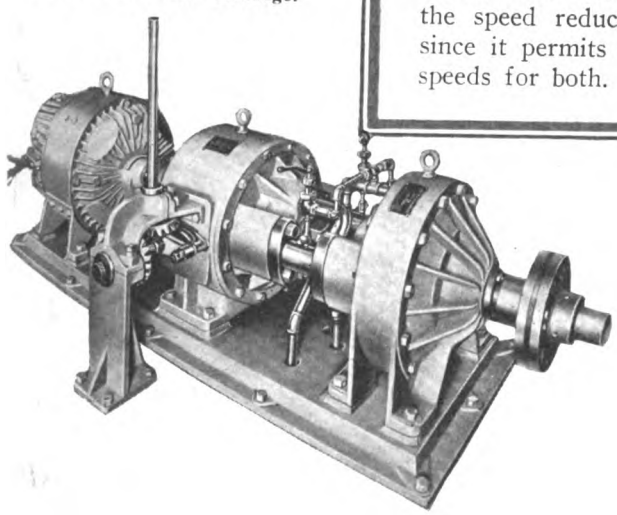


Fig. 3. In the above device, which is built by the American Engineering Company, of Philadelphia, an Hele-Shaw hydraulic pump and Hele-Shaw hydraulic motor are used as a speed reduction unit in place of the usual nest of gears. By utilizing hydraulic pressure, it is claimed, great power and silent, smooth operation are combined with extreme flexibility of control, friction is reduced to a minimum and high efficiency obtained. Any desired ratio of speed reduction can be had without stopping the direct connected electric motor or even changing its speed. This new device already has been adapted to a wide variety of uses, including presses, planers, mechanical stokers, and a wide variety of uses on shipboard for deck machinery.

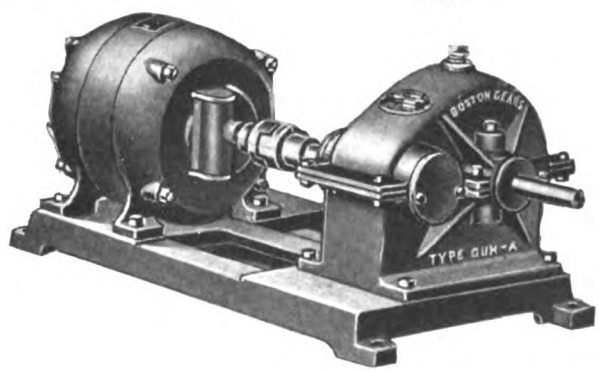


Fig. 4. The new type of speed reduction unit, above, is one of a series just put upon the market by the Boston Gear Works Sales Company, Norfolk Downs, Mass. The unit is specially constructed for obtaining high speed ratios within a small operating area. The GUH type is fitted with double helical (Herringbone) gears. The shaft is at sufficient height from the base of the unit to permit a large oil reservoir, the purpose being to provide a most efficient system of gear lubrication. Constructed for mounting on base with General Electric Motor, the GUH is fitted with Boston flexible insulated couplings, and can be used in a wide variety of applications.

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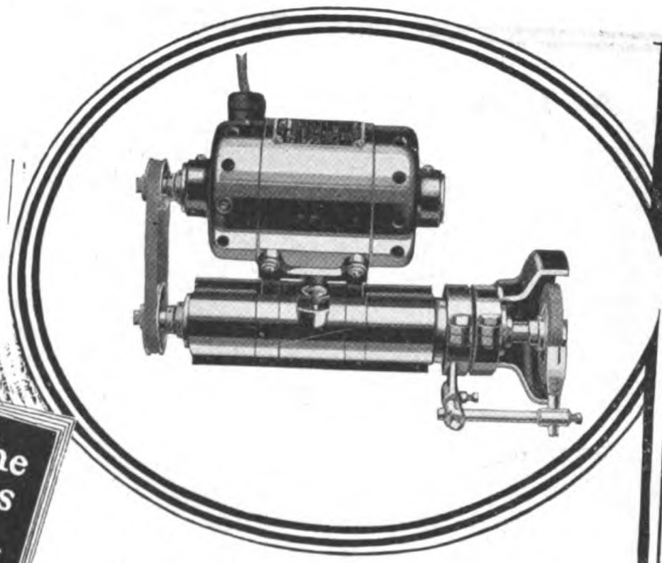
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Dumore No. 3—Multi-Speed Grinder

This Book Shows Grinding Stunts that Cut Costs

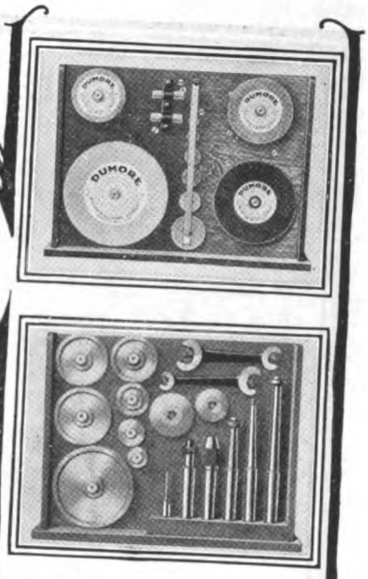
—Send for Your Copy Today!

CHUCK full of time and money-saving suggestions — containing actual photographs of grinding set-ups that have cut costs for others—showing how efficiently Dumore grinders do "the jobs that can't be done," our new book, "Hitting the High Spots," will prove mighty interesting to the man who likes to do good work—*quickly* and *economically*.

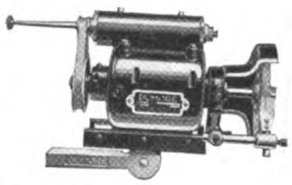
Regardless of the kind of work you do—irrespective of the nature of your business, if you maintain a tool-room or machine shop you'll find this book a real help in unsnarling those "stump" problems that come up so often. And all these valuable hints are free for the asking. Just fill out and send us the handy coupon below. Your copy of "Hitting the High Spots" will be sent by return mail. But start the coupon on its way today. The books are going fast!

A Few Dumore Grinder Advantages

Six distinct styles of Dumore grinders, each with individual speed ranges, provide a grinder with the correct cutting speed for any grinding need. Dynamically balanced armatures and selected ball bearings in Dumore grinder motors eliminate vibration—permitting maintenance of grinding limits as close as .0001, without taper, bell-mouth or chatter marks. Operating on alternating or direct current, these sturdy grinders are especially useful in shops supplied with two varieties of power current. Easily portable, they save the cost of tearing down expensive set-ups.

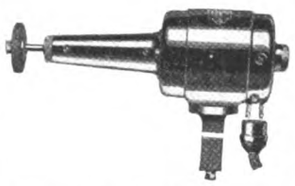


Wheel & Spindle Equipment Furnished with Dumore No. 3 Multi-Speed Grinder



Dumore No. 2—AG Grinder

For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R. P. M. Self aligning ball bearings. Comes completely equipped.



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An inexpensive tool for garage, repair shop or tool-room. Speed 15,000 R. P. M. Length of arm 4¼". Extension spindle 2". Grinder pivots on base.

WISCONSIN ELECTRIC COMPANY, No. 70, 16th St., RACINE, WIS.

DUMORE

HIGH SPEED GRINDERS



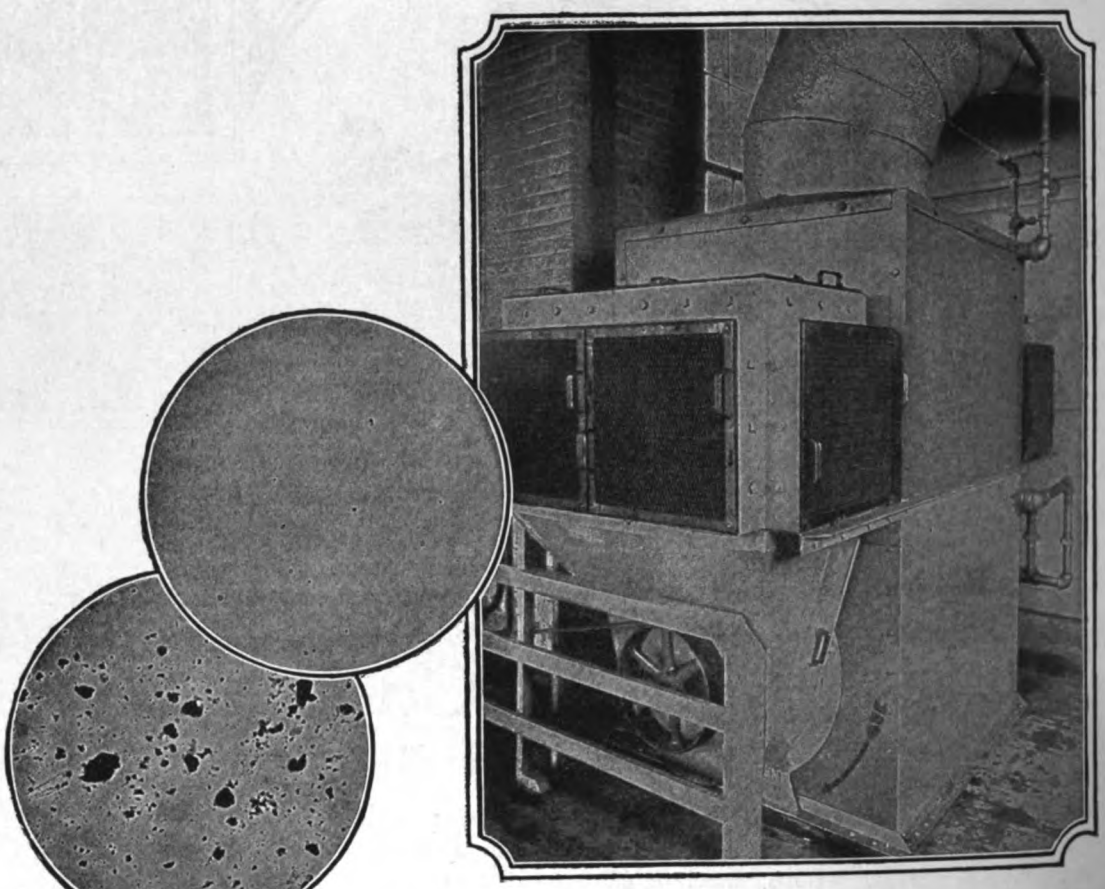
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I'm interested in cost-cutting grinding stunts and short cuts. Send me your booklet, "Hitting the High Spots."

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REED AIR IS CLEAN AIR



The illustration at the right shows the 12-unit Reed Air Filter on No. 4 Baetz Heater in finishing room of Baker R & L Co. At left, specimens of air (under microscope) before and after cleaning with Reed Air Filters. Other uses of Reed Air Filters are the cleaning of air for ventilation of buildings; protection of food products, delicate materials, air compressors, electrical machinery; control of dust etc.

Why Baker R & L Company Reordered Reed Air Filters

The Baker R & L Company, of Cleveland, Ohio, large manufacturers of electric tractors and trucks, have a twelve-unit installation of Reed Air Filters on the No. 4 Baetz Heater in their finishing room. They are now ordering an eight-unit installation for use in their baking room.

Satisfactory service is of course the reason. For if there is anyone who is in a position to know, it is the Baker R & L Company's foreman painter who says he is willing to put his finishing room "up against any in the country for cleanliness, air circulation and lack of varnish fumes."

Send for bulletin on the removal of paint spray, quick drying and ventilation in varnishing, enameling and painting rooms.

REED AIR FILTER COMPANY, *Incorporated*
211 Central Avenue, Louisville, Kentucky
Offices in Principal Cities

REED AIR FILTER COMPANY, Inc.
211 Central Avenue, Louisville, Ky.

Gentlemen: Please send bulletin on drying operations.

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Reed Air

TRADE MARK

filters ALL METAL

(*REED AIR FILTERS are manufactured under patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending.*)

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An Elevator Tructor for Charging Heat Treating Ovens

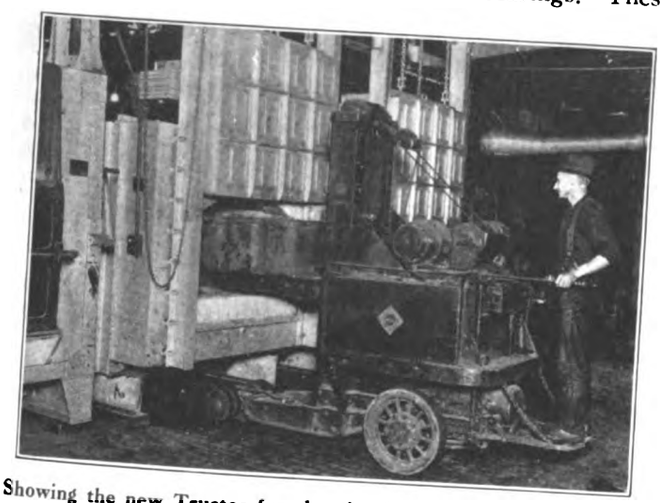
THE increased use of alloy steels in the machine tool and automotive industries has resulted in great impetus to the heat treating operation.

Gas, oil and electric furnaces have come into general use and the success attained in treating heavier pieces has brought a demand for better facilities for handling the output. To keep apace, Elwell-Parker Electric Co., Cleveland, Ohio, has developed a new type of portable battery driven furnace charger.

This unit is propelled by an Elwell-Parker electric motor and is steered on all four rubber tired wheels. The drivers are 22" x 4½" while the trail or smaller wheels beneath the load supporting forks carry dual differentiating 10" x 6" tires.

The load supports consist of two 92" by 8" horizontal fingers upon which ten 300 pound packed furnace boxes are placed. The bottom of the furnace is provided with two slots to receive the lower flanges of the fingers. The furnace floor between and at each side of the slots supports the boxes or pots when the fingers are lowered and withdrawn. The furnace is set above the floor to provide clearance for the smaller axle thrust beneath the furnace when charging or discharging.

The fingers are secured to two steel arms which are provided with hardened rollers on ball bearings. These



Showing the new Tructor for charging heat treating ovens, which is said to save time, labor and furnace heat.

rollers travel on renewable ways attached to 8" upright channels. The lift carriage or elevator head also carries two stub tooth pinions engaging cut steel vertical rack on the rear flanges of the uprights. These pinions are driven or rolled on rack by means of two grooved drums with differential between. Two cables on these drums pass over sheaves at top of uprights, thence to a motor driven hoist over battery compartment. The lifts are from 11 to 72 inches high as required.

The unit will be furnished with a double drum hoist such as used on Elwell-Parker portable cranes when an extra cable line is required for additional pulling purposes.

It formerly required three men 20 to 25 minutes to place 10 pots by means of long spades into a furnace, but with this tool one man raises the furnace door, delivers and places the pots in 2 to 3 minutes, saving not only time but also considerable furnace heat.



Reynolds Improved Truck

Lansing Company specifies Metzgar Wood Wheels on trucks and trailers

WHY?

Because this Company is up-to-the-minute and want to give their customers the greatest possible value for the money.

It is poor economy to operate trucks with badly worn and damaged wheels—It is like, "Saving at the spigot and losing at the bung."

Better save your floors and keep your production to the highest point by the use of Metzgar Wood Wheels.

It is simple to order these wheels for all replacements and make those OLD TRUCKS BETTER THAN NEW.

It is just as simple to specify Metzgar Wheels when ordering any new trucks and thus stop that continuous floor-repairing at its source.

Write today for booklet and prices.

METZGAR COMPANY, Inc.
Grand Rapids - - Michigan, U. S. A.

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End-Grain Wood
WHEELS

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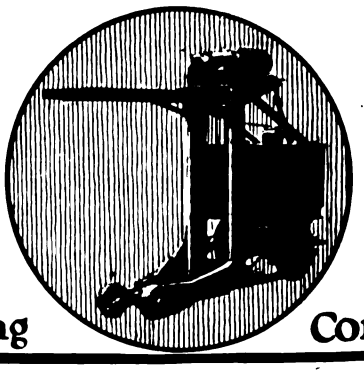
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Send for Booklet—"Snap Shots of Sensible Savings"—contains instructive pictures of applications in various industries.

Manufacturers of Tier-Lift Trucks, Tractors, Trailers and Narrow Gauge Railway Equipment.



The Lakewood Engineering Company, Cle

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The Motor Truck as a Locomotive

Increasing the Efficiency of Industrial Hauling

By J. Roberts

THE average truck motor has power far in excess of what is required to haul its rated load on good, fair and reasonably level roads. Present day efficiency demands that this excess power be taken advantage of continuously by the use of semi-trailers.

A truck and semi-trailer combination can carry two or three times as much load as a truck is rated to carry. But at the same time the truck and semi-trailer combination will use only about 10 per cent. more gasoline.

One of the great advantages of semi-trailer equipment is most evident in industrial operations. By the use of three semi-trailers one truck tractor can be kept moving all the time. One trailer is hauled while another trailer is being loaded, and the third trailer unloaded. This reduces the idle hours of the truck tractor to the absolute possible minimum.

The time of one or two drivers is saved by the hauling of additional loads with semi-trailer equipment. The use of the three semi-trailer shuttle system also saves the time of men engaged in loading and unloading. No time is wasted in waiting for trucks to return with loads or to take on loads.

The temptation or tendency to overload trucks with consequent damage to their frames and mechanism is largely removed if semi-trailers are employed. The presence of the trailer does not greatly reduce the possible speed of the truck. A factor in the human element in connection with this fact is that the driver will be found less likely to speed when he knows he is hauling a greatly increased load.

Nearly every state has limitations on the weights per axle on vehicles operated on the public highways. By the addition of the extra axle on the semi-trailer, the allowable weight is almost doubled in practically every state. For the handling of large and bulky loads or long poles, pipes, steel beams, etc., the semi trailer may be used to advantage.

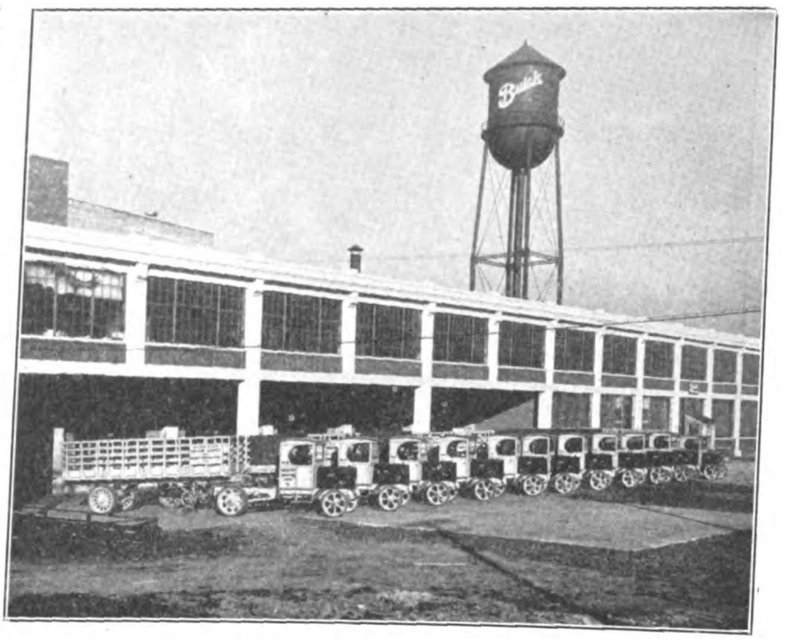


Fig. 1. A fleet of trucks and semi-trailers operating on regular schedule for the Inter-City Trucking Service, between Detroit, Pontiac and Flint, Michigan.

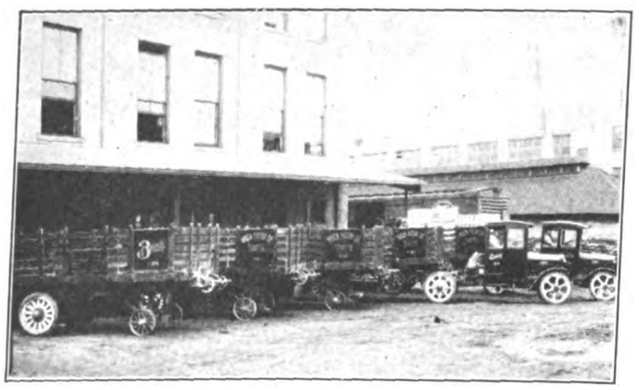


Fig. 2. Note here (at the Buick plant) that three empty trailers are awaiting loads, without tying up the motive power; an important source of increased efficiency.

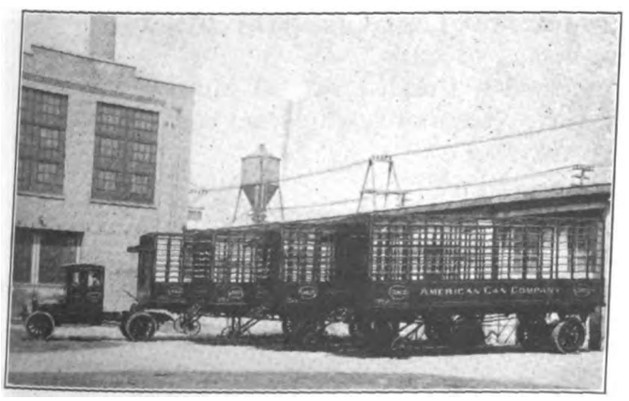


Fig. 3. Some of the hauling equipment of the American Can Company. Picking up or dropping of a trailer is accomplished without the driver leaving his seat or requiring a helper.

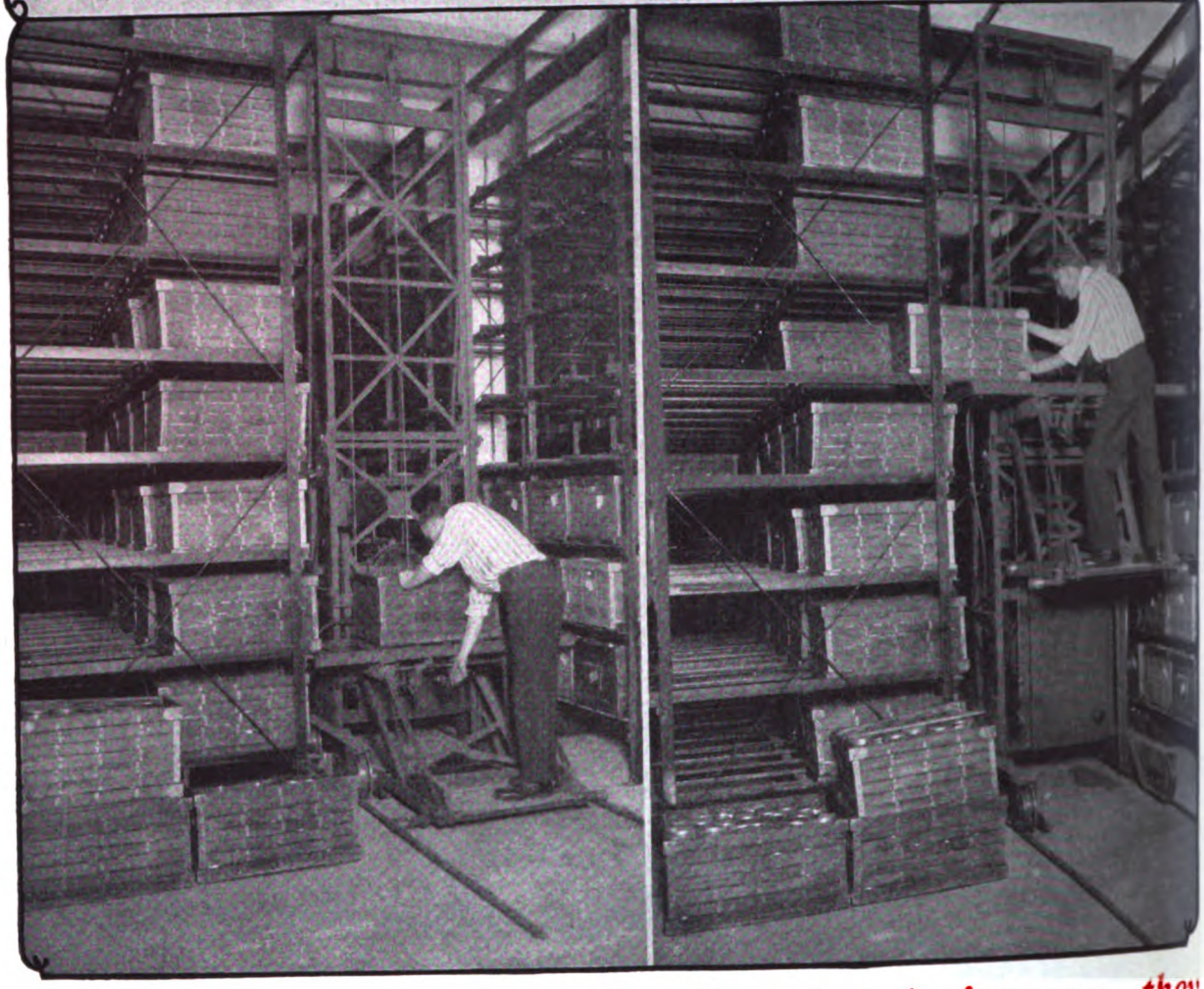
Semi-trailers are designed to follow closely in the tracks of the truck or tractor. There is no shifting or swaying. Backing is easy. Coupling and uncoupling is automatic and readily accomplished. The driver never leaves the cab because convenient control levers enable him to effect a coupling and uncoupling and operate the brakes of the semi-trailer in an efficient manner.

The semi-trailer is a vehicle of simple construction and all parts are very strong. There is no delicate machinery to wear out and become disordered, and repairs or replacements excepting tires, are negligible.

Semi-trailers can be obtained in a wide variety of forms and lengths, adapted to different sorts of service. A single truck with semi-trailer equipment can be used to transport varying types and sizes of material.

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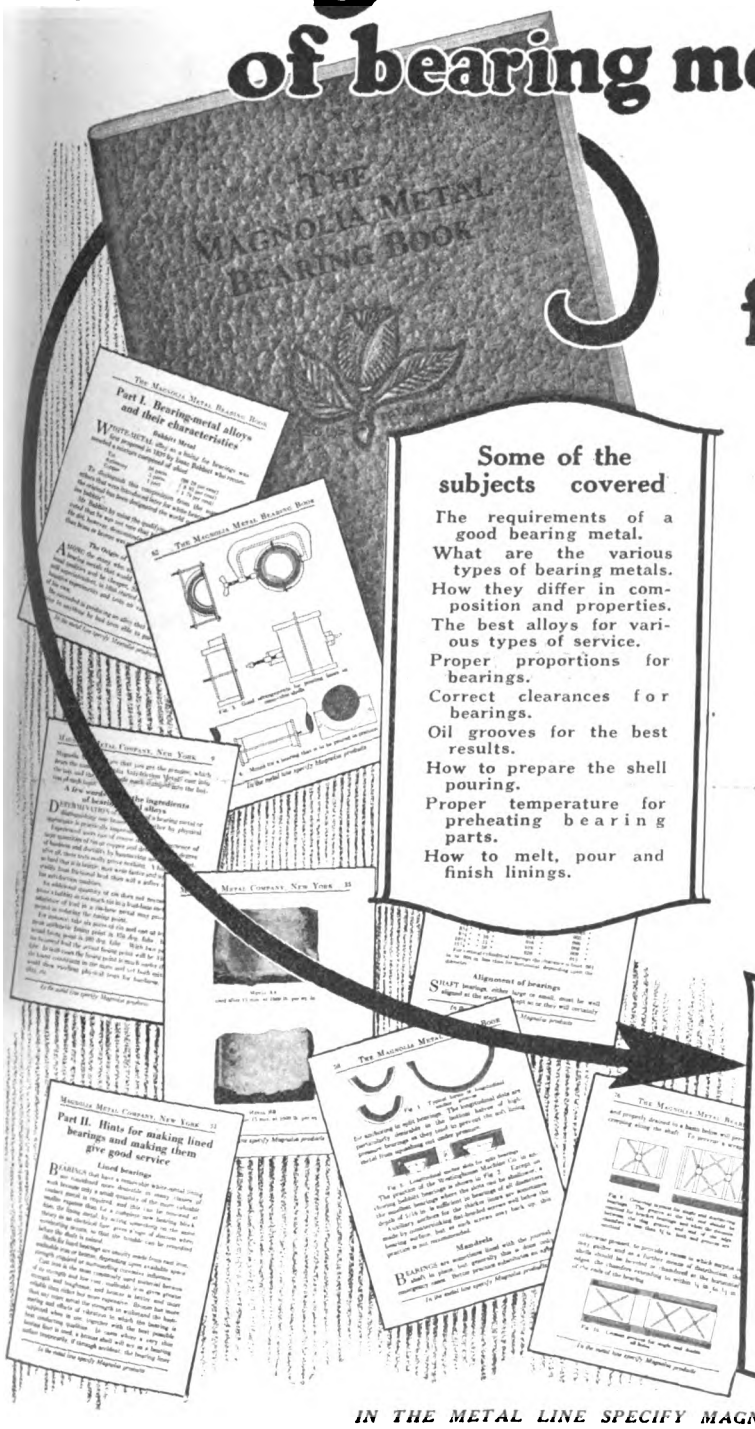
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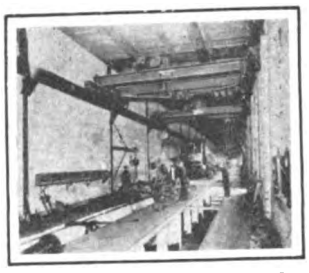
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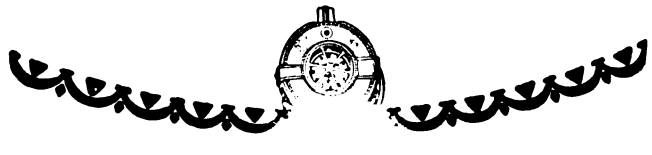
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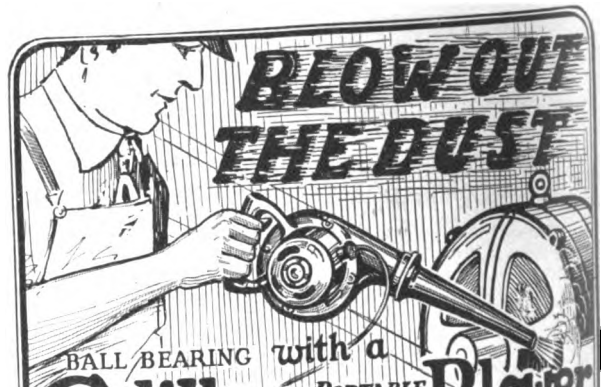
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The CADILLAC Blower blows out this dirt and has hundreds of uses around machinery where dust and dirt accumulate.

Equipped with NORMA Precision Ball Bearings. Attaches to any light socket. Instantly convertible for suction cleaning.

Write for descriptive folder giving prices and testimonials by leading manufacturers

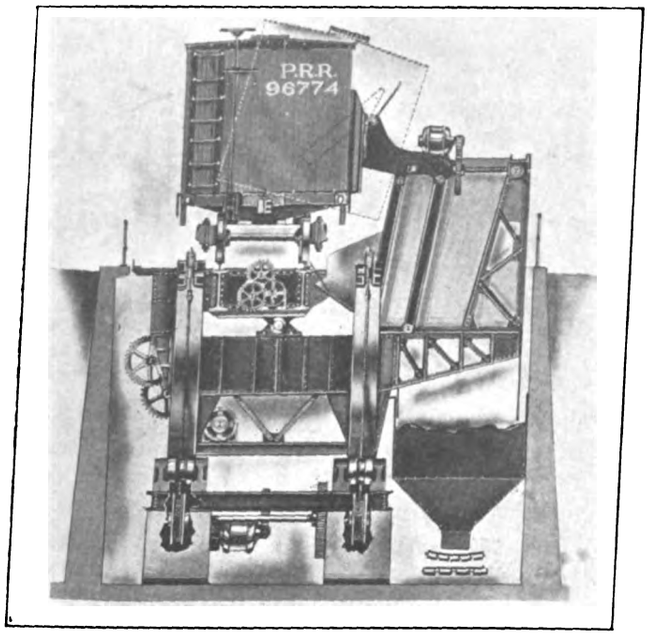
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612 Fulton Street, Chicago
Canadian Factory: 74 Duchess Street, Toronto

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Interesting New Features in a Box Car Unloader

THE Box Car Unloaders which the Philadelphia Grain Company recently ordered from the Link-Belt Company of Chicago for their new Port Richmond Elevator will contain many new and interesting features of design which represent a marked advancement over many grain car unloaders now in use.

The loaded grain car, with its outer door open on the dumping side, is spotted on the platform of the unloader approximately central by a car haulage system, small locomotive, or otherwise. The disappearing end clamp carriages are simultaneously brought into position in contact with the car couplers, thus positively centering the car on the main cradle. This operation also automatically removes the end posts from beneath the car supporting platform. The grain door is then removed by the door opener, and the car tipped sidewise 15 degrees. With this operation a large percentage of the grain in the center of the car is discharged into the receiving hopper. The main cradle is next tipped to a maximum of 40 degrees to the horizontal in one direction to discharge the grain from one end of the car. With the upper end of the car empty a baffle plate is inserted through the door opening and the cradle tipped to an angle of 40 degrees to the horizontal in the opposite direction, discharging the grain from the other end of the car.



After the car has been emptied of its load, the side tipping and longitudinal tipping platforms are again brought to normal horizontal position. The door opener is withdrawn and the end clamp carriages are run into their pits. This operation of the end clamp carriages automatically places the end posts under the corners of the car supporting platform. The empty car is then moved off the platform by means of the car haulage system. The time required for the complete cycle of operation of the unloader is 3½ minutes. With the car spotting system planned and a conveying system large enough for taking the grain away there should be no difficulty in maintaining an average unloading capacity of 16 cars per hour with two machines.

Never Forget PRECISION



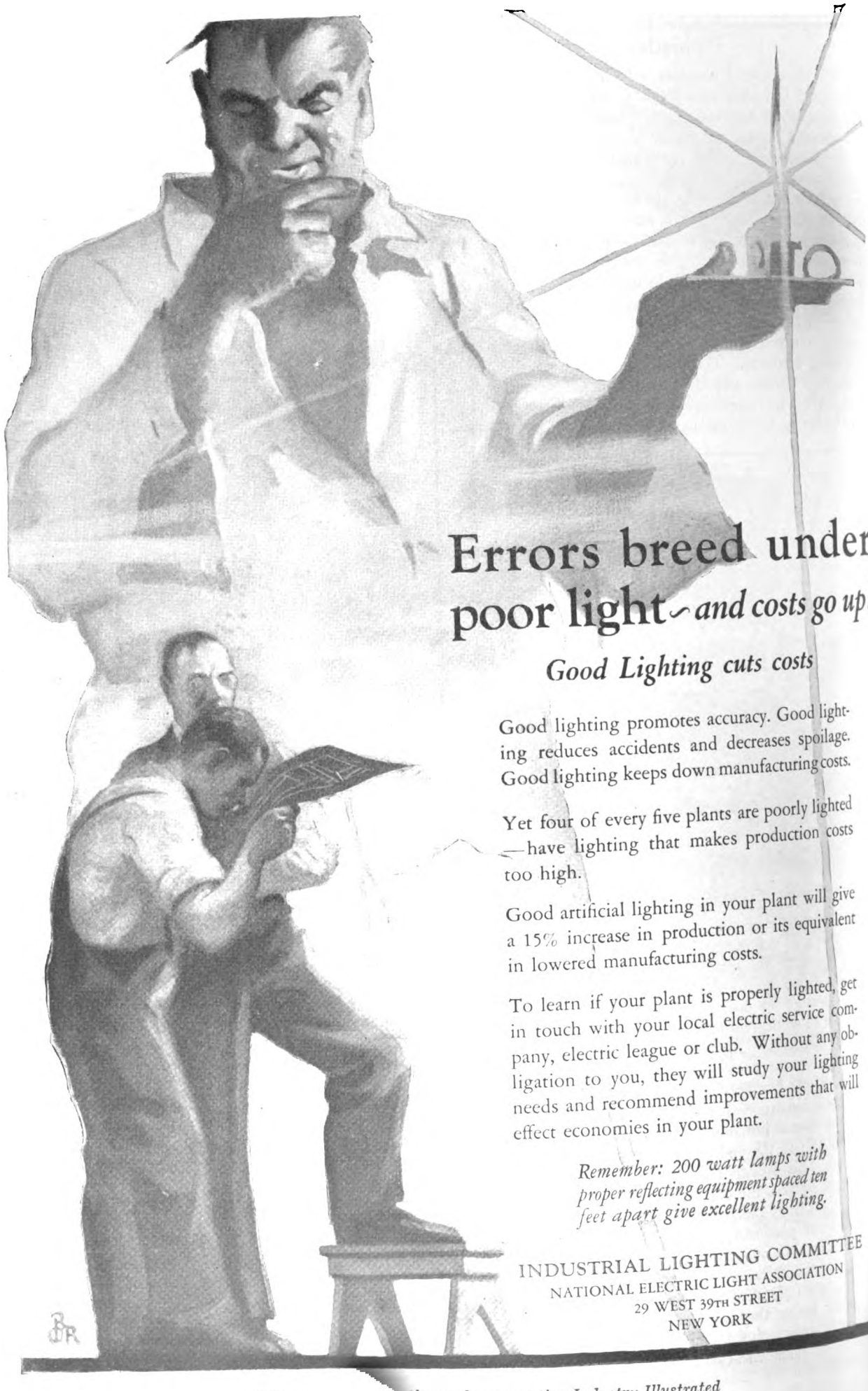
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Good Lighting cuts costs

Good lighting promotes accuracy. Good lighting reduces accidents and decreases spoilage. Good lighting keeps down manufacturing costs.

Yet four of every five plants are poorly lighted—have lighting that makes production costs too high.

Good artificial lighting in your plant will give a 15% increase in production or its equivalent in lowered manufacturing costs.

To learn if your plant is properly lighted, get in touch with your local electric service company, electric league or club. Without any obligation to you, they will study your lighting needs and recommend improvements that will effect economies in your plant.

Remember: 200 watt lamps with proper reflecting equipment spaced ten feet apart give excellent lighting.

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NATIONAL ELECTRIC LIGHT ASSOCIATION
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THE HANDY LIGHT ON A REEL

An Aid to Correct Industrial Illumination



THE Appleton Reelite brings the illuminating unit or the tool directly to the job.

In the illustration here, the Appleton Reelite is shown in the plant of the Yellow Cab Mfg. Company, employed as a means for bringing the tool to the job and for providing an inspection lamp.

The R-L-M Dome Reflectors employed in this plant provide ample illumination for the ordinary run of the work. To install additional fixed units for the special illumination required would be expensive and with the Appleton Reelite available, unnecessary.

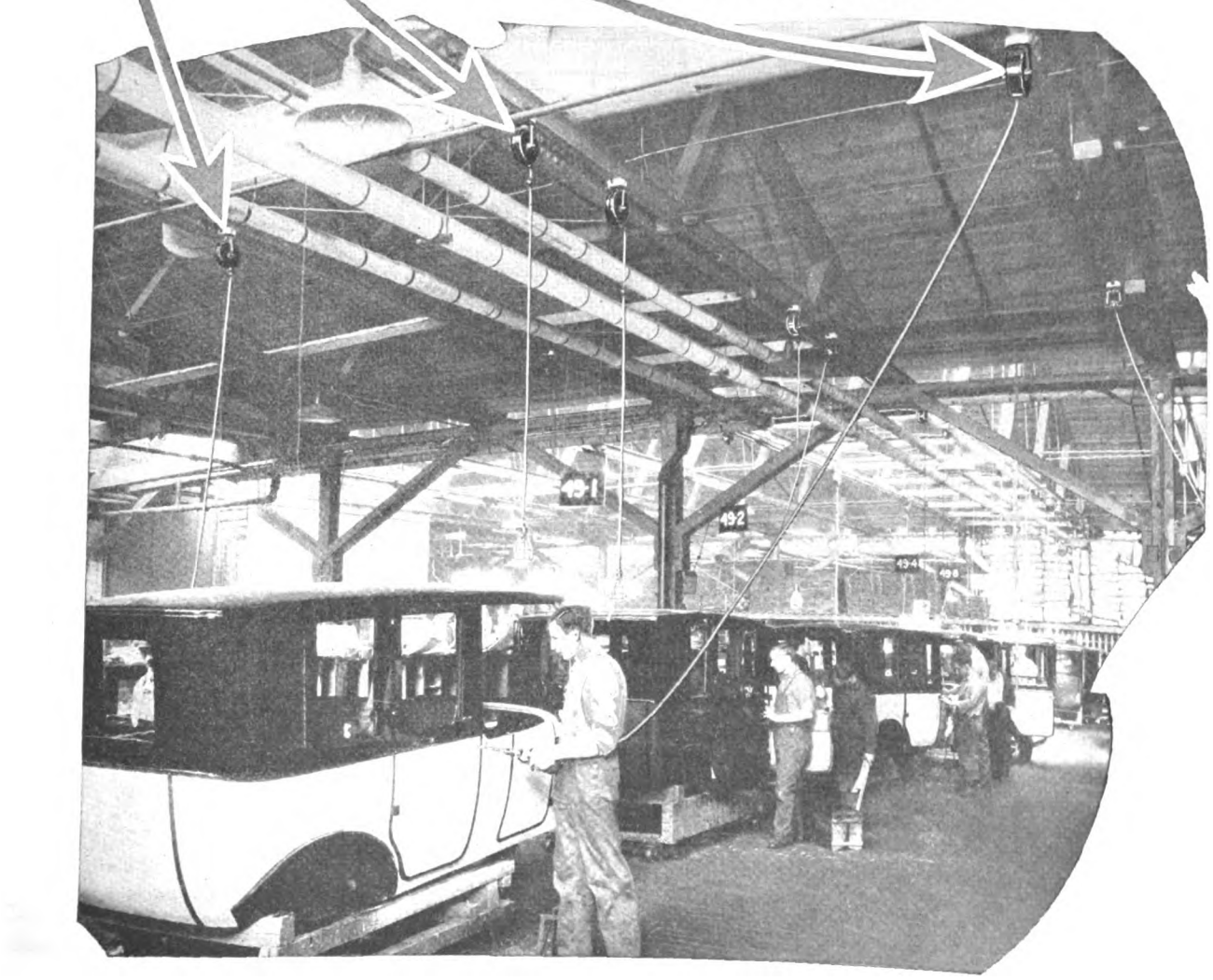
The Appleton Reelite is, furthermore, more flexible in its range of usefulness than any other type of portable outlet.

The Appleton Reelite has been adapted to many different uses among many varied industries. It can be employed in your plant, economically and efficiently. Let us know what the conditions are and what you want to accomplish. Our engineers will discuss the matter with you without obligation on your part.

Appleton "Unilets" and Fittings are other aids to Correct Illumination that you should know about. Ask for catalog.

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Stop Those Needless Production Losses

If the only loss from a worn-out, or burnt-out, sleeve bearing in your machine were the cost of replacement, it wouldn't be so bad—though bad enough. But beyond that there are the big shut-down losses—interrupted operation, upset schedules, reduced output.

Precision Bearings will protect you against these losses: "NORMA" Precision Ball Bearings, for lighter loads and higher speeds — "HOFFMANN" Precision Roller Bearings, for heavier loads and harder service: both with "magazine" lubrication in the mountings, to make them neglect-proof and forget-proof.

Let our engineers work with yours, on the hardest bearing problem you have. No obligation.

"NORMA"

BALL BEARINGS

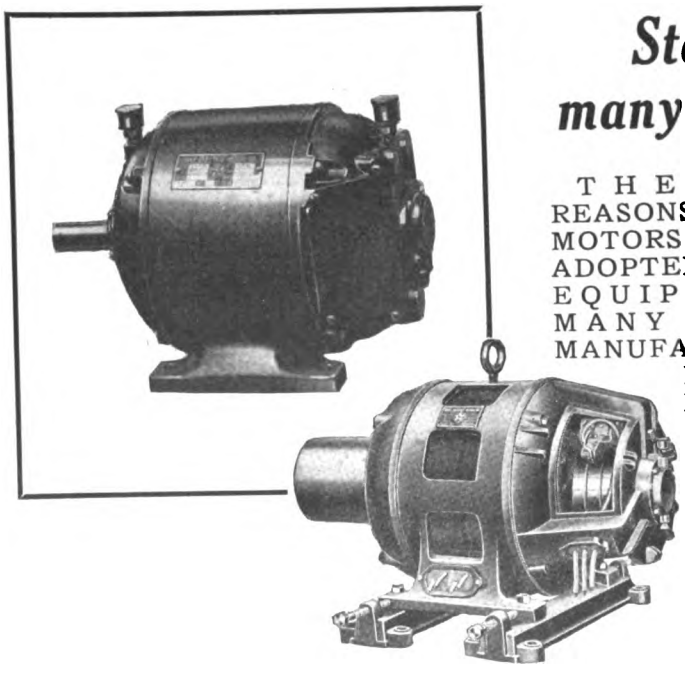
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Highest grade of material and workmanship.

Ball Bearing construction insuring long life, high efficiency and the least possible attention. Preferred by U. S. Navy and adopted by the Steel Industries and many others as standard type of bearings for their motor requirements.

Mechanical features can be designed or altered to suit special requirements of the manufacturers.

A complete line of Direct and Alternating Current Motors ranging from ¼ to 75 H. P. inclusive, in all standard voltages and commercial frequencies, Horizontal and Vertical shaft construction.

Write for particulars.

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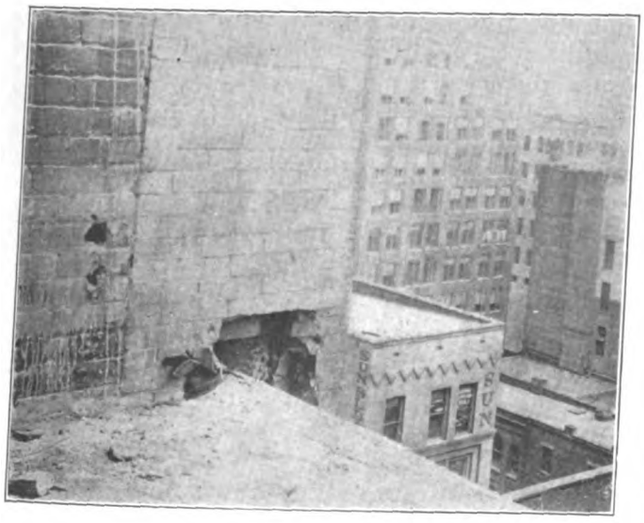
Welding Building Girders Instead of Riveting

CONTRACTORS on the twelve-story addition to the Peoples Outfitting Company store building on Michigan Street in Detroit, eliminated the necessity of tearing down the side wall to the old building to which the addition was joined and were saved the expense and work of constructing temporary walls within the store while new construction was going forward.

Instead of following the old time practice of riveting where an addition was made to a large commercial structure, the general contractors employed a welding company to bind the girders of the old and new structure together. A total of 103 girders were welded on the Peoples Outfitting job. Connection plates were used on the job, two being required for each joint as one was welded on each side of the web.

The building columns of the structure are 12″ to 14″ H Section. The floor girders in the Peoples Outfitting building are 10″ to 24″. The load required for each girder is 12,000 pounds.

Because the welding process on this kind of a job was a comparatively new thing to Detroit public officials, they took a "show me" attitude on it, and required severe tests. In order to satisfy the Bureau of Safety of the city, a 9″ by 9″ I beam was welded to a 7″ by 7″ column. In order that the strength might be determined, the I

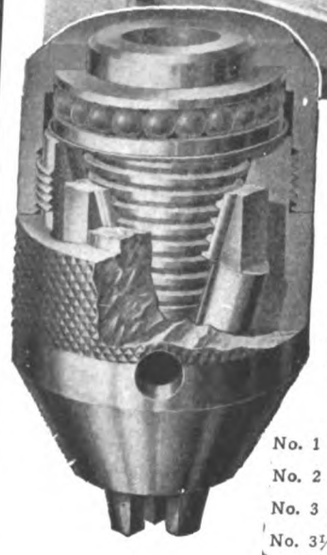


beam was sheared off in a testing machine, and it was not until what corresponded to a load of 110,000 was applied that the weld sheared off. In other words, it was shown that the weld stood nine times the load required to be carried for this building.

On the Peoples Outfitting Company job only an average of two and one-half hours was required for the welding of each joint. The money saving brought about through welding is said to have run into a large sum.

From the standpoint of the owners of the department store, it is said that advantages other than the saving in time and actual money, were of outstanding importance. Because the welding could be done on the girders of the building without disturbing to any extent the old side wall, it was possible to put up the 12-story addition without getting any dirt or dust on merchandise in the original unit, where business was carried forward as usual.





Ball Bearing Keyless Hand-operated Self-tightening Drill Chucks

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No. 3½ Ettco— 1/8 to 5/8 in.	11.00

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594-602 Johnson Avenue Brooklyn, New York

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DRILL CHUCKS

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Shortly afterward we began designing and testing hand-pads, arm protectors, leggings, aprons and complete suits for workmen. Although the experiments took considerable time they proved a mighty profitable investment, for—

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"The protected man is the productive man"

This Coupon is, in reality, an opportunity. Take advantage of it!

Send me a copy of your booklet, "Safeguarding Industry's Greatest Asset: Man."

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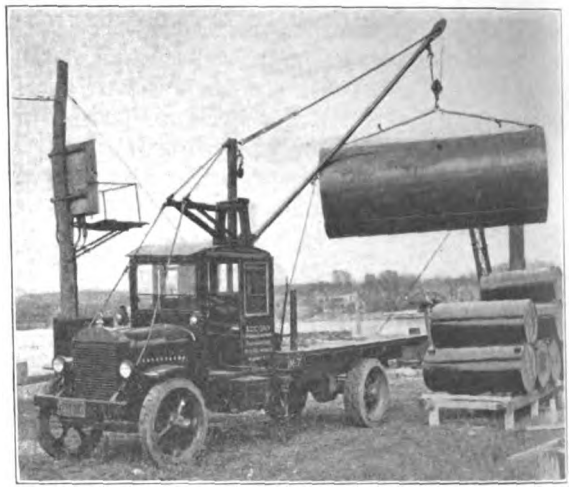
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A New Portable Crane for Light Trucks

TO meet the constantly growing demand for a lighter truck-crane combination, the International Motor Company has developed a crane, mounted on Mack trucks of 1½, 2 and 2½ tons capacity.

This crane, primarily designed for the purpose of unloading 1,000 gallon fuel oil tanks from gondola cars,

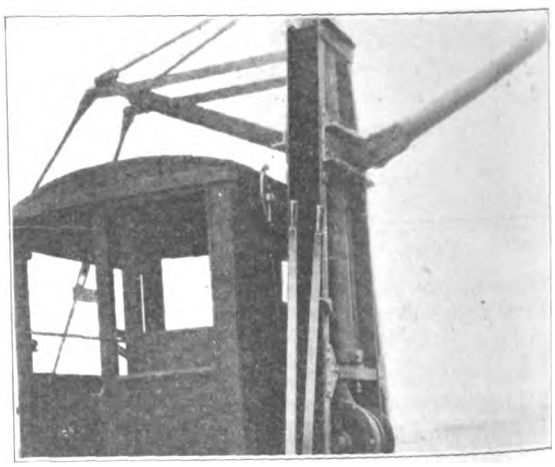


Hoisting a 1,000 gallon fuel oil tank, weighing 15,000 pounds

is adaptable to many other uses; such as handling gasoline drums, barrels, stone slabs, etc., weighing upward to 2,500 pounds.

The equipment consists of a mast, braced and anchored to the chassis frame; a special drum-winch and two booms; the longer of which is shown in the accompanying illustration.

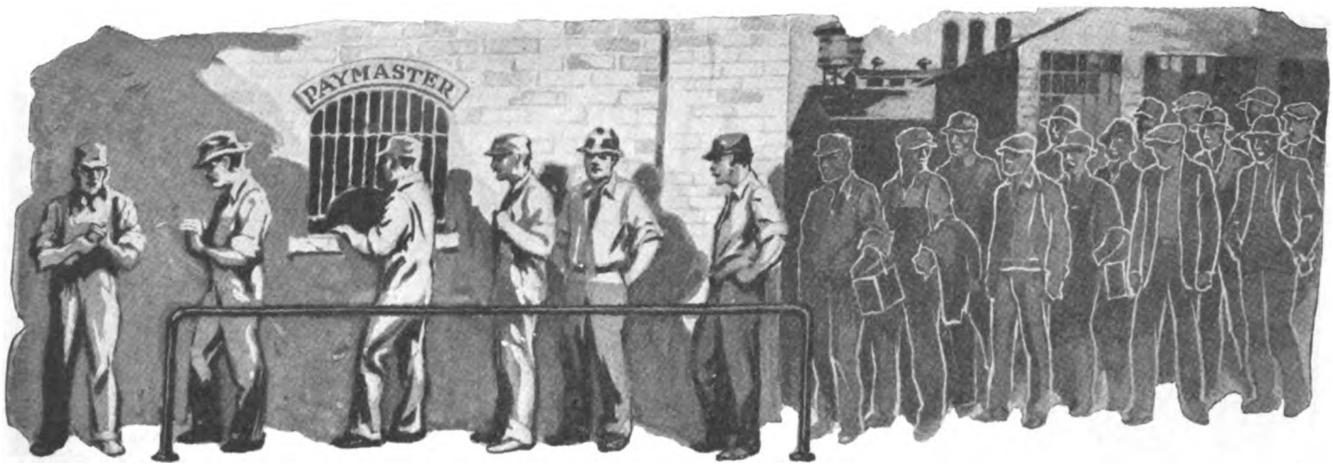
To insure rigidity of the chassis while the crane is being operated, two jack screws support the mast from



View of the new crane controlling units

the ground. These screws are attached to the cross-members under the mast by means of a swivel arrangement, so that when not in use, the free ends may be fastened to brackets on the sides of the frame.

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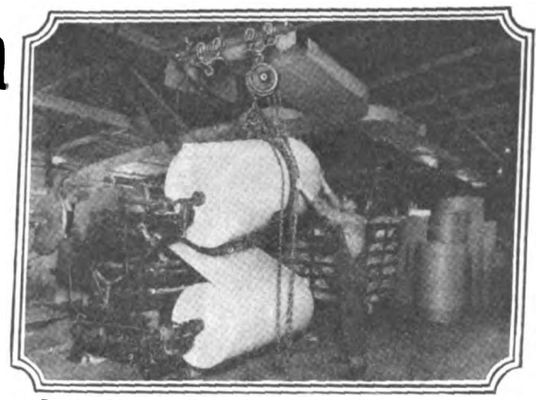


Saves Wages of 14 Men

"—it reduced our pouring gang from 20 to 6 men"—*International Motor Co.*, Manufacturers of Mack Trucks, New Brunswick, New Jersey.

This is a saving that shows at once in the pay-roll—but Louden Monorail does ***more*** than save wages. It expedites material handling in all departments—speeds up production. It introduces a factor of safety which saves injuries to workmen and breakage of products.

In practically every line of industry, Louden Monorail has proved itself to be one of the greatest of all production economies, where loads up to 2000 lbs. must be moved.



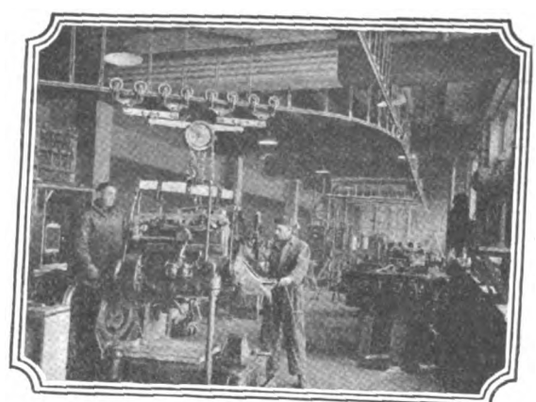
Placing 53 inch roll, weighing 810 lbs. Nine folding machines served by two men—this formerly required labor of six men. Northern Paper Mills Co., Green Bay, Wisc.

LOUDEN

OVERHEAD CARRYING EQUIPMENT

Saves time, labor, floor space, floor wear, breakage and re-handling expense. It can go anywhere, from department to department, floor to floor, building to building. Uses for this equipment are practically unlimited whereby large savings can be made at comparatively moderate installation cost. We have hundreds of reports like these: "It saves the wages of 4 or 5 men besides increasing production."—Beggs Foundry Company. "It has reduced our pouring gang 50% and paid for itself several times."—McKenna Brass and Mfg. Co. "One man with Louden does 4 trucker's work."—Penna. Furniture Co. "One man does work of 4 in putting beam in machine. No danger to men, and less breakage of beam heads."—F. C. Huyck and Sons Co. "Saves ½ the help. Minimizes breakage of ware."—B. O. T. Mfg. Co.

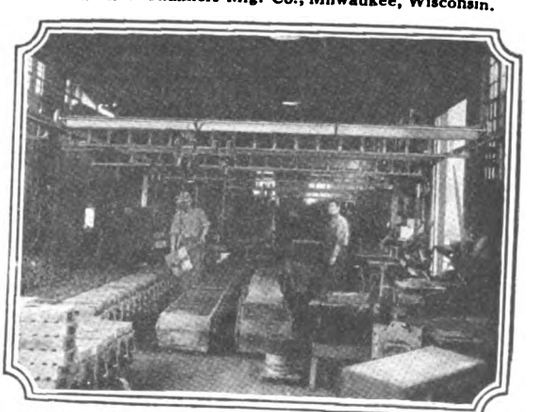
The opportunity to show what a Louden System would do for you is all we desire. You will commit yourself to NOTHING by allowing one of our engineers in your vicinity to make a survey and report to you on the material handling savings that can be effected within your own particular plant. Just drop us a line.



Setting 1700 lb. motor quickly, easily, safely. Monorail can be routed over machines and heavy parts spotted on them. Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin.

Send for Louden Overhead Book

It pictures many installations in various industries, from a few feet of track to many miles—all paying a profit on the investment. Send for your copy now.



Load run from stationary track onto Louden Push and Pull Traveling Crane and taken to any point under crane-way, or shifted and run off on another track. Bagley and Sewell Co., Inc., Watertown, New York

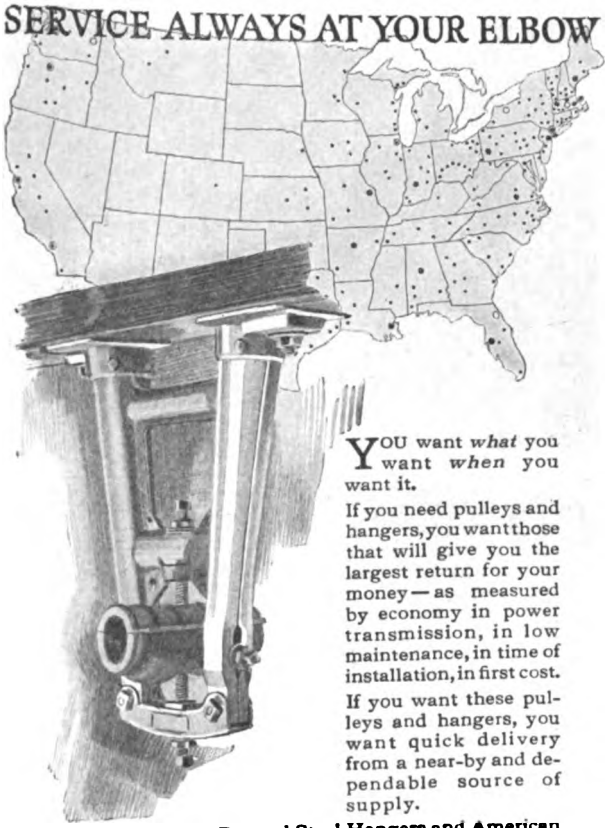
The Louden Machinery Company

589 West Avenue (*Established 1867*) Fairfield, Iowa

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YOU want *what* you want *when* you want it.

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In American Pressed Steel Hangers and American Steel Split Pulleys you find this combination of service and convenience.

From Miami to Seattle, from San Diego to Bangor, from New Orleans to Duluth, you are never more than a few hours' shipping time from a supply of "American" Hangers and Pulleys.

The map indicates the towns where there are "American" dealers. The name and address (and generally the 'phone number) of every "American" dealer is listed in Mac Rae's Blue Book. You will find that list of names impressive both in number and in character.

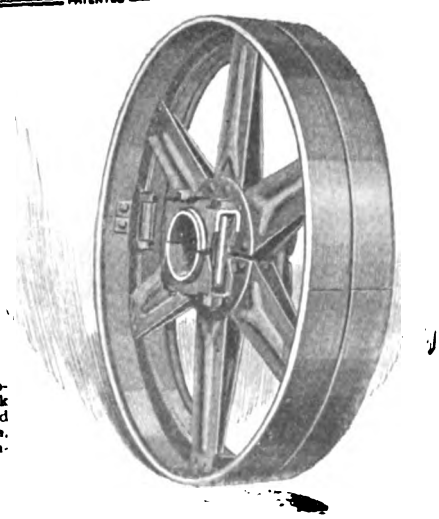
Ask your secretary to write for descriptive printed matter.

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers and Pressed Steel Shapes.

4200 Wissahickon Ave. Philadelphia

AMERICAN
PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS
PATENTED PATENTED



For list of distributors carrying stock outside of the United States of America, see Lamb's International Guide.



—more work *in*—less time *out*

This is the big thing that R-S Vertico-Slant Sanitary Drinking Fountains will accomplish in your plant—

Your employees will *put more work in*—when invigorated with plenty of clean, fresh water. They will take *less time out*—because the fountains are conveniently reached within the fewest possible steps.

Lips can't touch the R-S Nozzle. The slight slant stream prevents water from falling back upon the jet. The contamination of lip-contact is eliminated.

The R-S line includes Sanitary Drinking Fountains, Bath and Plumbing Fixtures and Supplies. Write for illustrated catalog with prices, specifications and complete information.

RUNDLE-SPENCE MFG. CO.

59 Fourth St., Milwaukee, Wis.

RUNDLE-SPENCE

The WRIGHT HOIST

Do you consider all chain hoists alike, or do you *know* the "Wright" hoist to use and to specify?

It is the one hoist that is different — that has forged ahead and has given you a design and construction unlike any other hoist: the hoist of 21 points of engineering supremacy that save you money and give you safety.

Ask for proof.

WRIGHT

LISBON, OHIO

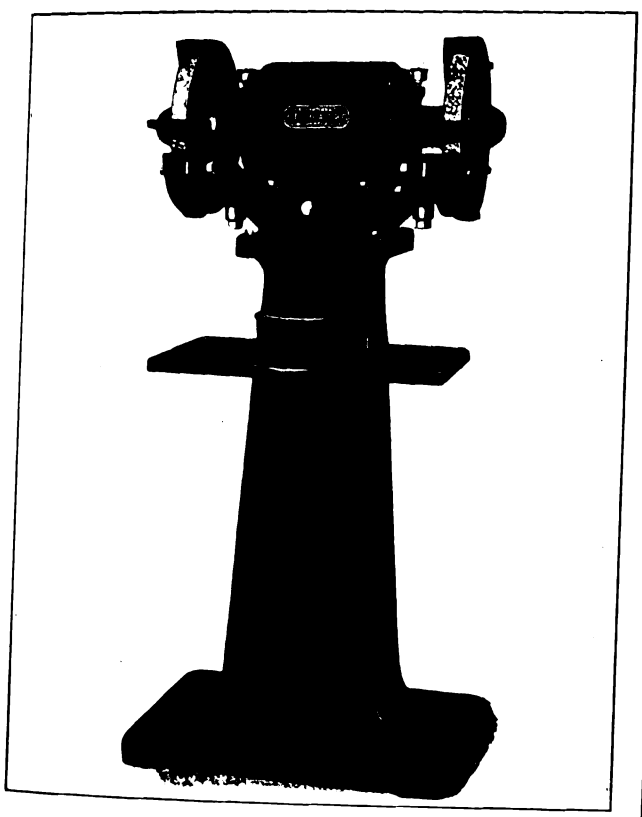
Steel Safety Straps
Ball Bearing Spindle
New Process Chain
Improved Ball Bearing
Detachable Coupling

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Have Redesigned Their Bench and Floor Grinders

THE Cincinnati Electrical Tool Company, Cincinnati, Ohio, have recently redesigned their ½ and 1 hp. heavy duty bench and floor type grinders and are now furnishing them equipped with fully enclosed wheel guards, adjustable to the wear of wheels, as shown in the accompanying illustration.

These guards comply with the safety standards in the various states, and insure absolute protection to the operator at all times.

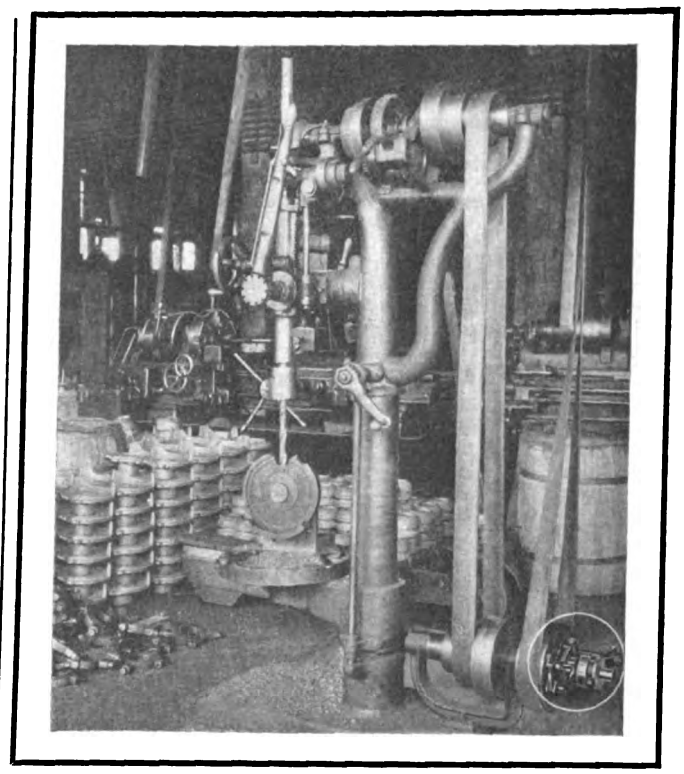


The motor is ball bearing, the bearings being lubricated through grease cups on each end of the motor housing.

The patented starting switch is of the quick make and break type and is entirely enclosed in the base of the motor.

THE new immigration law has not only effectively stemmed the influx of aliens into the United States, as was intended, but appears to have done so in excess of all expectations during the first year of its enforcement, according to an analysis of immigration statistics for 1924-25 made by the National Industrial Conference Board, 247 Park Ave., New York. Net immigration during the fiscal year 1924-25 was less than a third, or 32 per cent., of what it was during the year before.

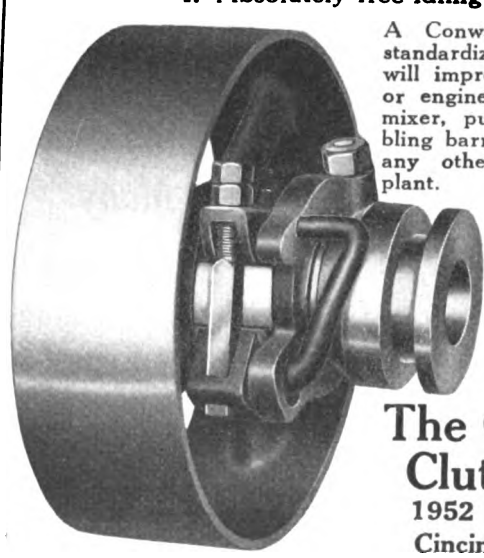
Common labor, such as is used in industry, is the class of persons principally affected by the new conditions accompanying the enforcement of the 2 per cent. quota act. Owing to the curtailed immigration and the numerous departures of unskilled laborers, a net loss of 15,106 of this class was sustained during the year, as against a net gain of 70,742 in the year 1923-24.



The Conway Clutch on Your Drill Press

Means

1. 900 R.P.M. if desired
2. Quick Easy Engagement
3. Instant Release
4. Absolutely free idling



A Conway Clutch is a standardized product that will improve any machine or engine, elevator, hoist, mixer, punch press, tumbling barrel, drill press or any other unit in your plant.

Write for Bulletin 35

The Conway Clutch Co.
1952 W. 6th St.
Cincinnati, Ohio

Conway Clutches

The Conway Clutch will deliver all the power the belt, chain or gear train can bring up to it.

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Minutes Mean Money

LOST TIME IS LOST MONEY
CHECK IT

(Minute, Hour, A. M., P. M. and Date Works Automatic)

DO YOU KNOW—what time that batch of orders, letters, contracts came in—or left the office?—that the one sure way to accurately check up on all the little time-consuming operations of the day, IN OFFICE AND FACTORY ALIKE, is the



MASTER MODEL
TIME STAMP

Avoid Disputes and Errors

This is a time stamp built for long service and economy, smooth, quick and accurate in action.

Catalog? Yes, an interesting one, too! Send for it now.

THE MACHINE YOU WILL EVENTUALLY BUY

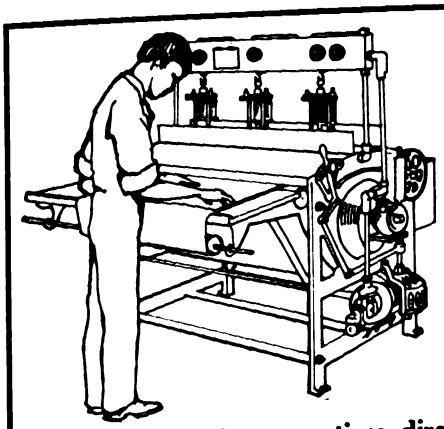
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Time Recording Since 1893



Blue Prints Serve Many Purposes

Window signs, factory notices, direct mail pieces, price lists, etc. And, when Paragon Blue Printing Machinery is used, they can be made at extremely low cost.

There is an importance attached to blue prints that compels attention. Why not take advantage of this fact? You can use Paragon Equipment for this as well as for your regular blue printing requirements.

Paragon Machines are reasonably priced, but in competitive tests have far surpassed machines that cost considerably more.

With Paragon equipment you can produce perfect blue prints in 4 minutes—prints that are washed, dried, ironed smooth and flat, ready to use.

Write for full information and illustrated catalogue.

PARAGON MACHINE CO., Rochester, N. Y.

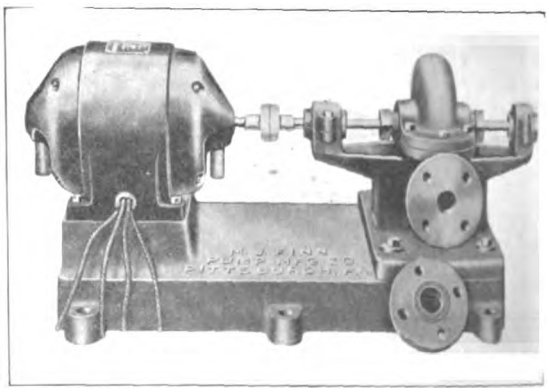
PARAGON BLUE PRINTING EQUIPMENT

New Motor Driven Pump Eliminates Thirty-Two Parts

THE M. J. Finn Pump Manufacturing Company of Pittsburgh, Pa., has recently placed on the market a new motor-driven centrifugal pump, which by its design eliminates thirty-two parts and which, through its application to heating systems is said to effect great fuel saving.

In its operation as applied to a heating system, the pump tends to create a vacuum, returns the condensation from the return lines, coils or radiators that are on a line with, or below the level of the water in the boiler, thus eliminating any sluggishness in the heating system. At the same time it introduces live steam into the returns, throwing off heat into rooms instead of cold condensation. The vacuum that this pump creates permits the water to be boiled in the boiler at a lower temperature than otherwise possible.

The design of the pump is simple, consisting of merely a bronze centrifugal pump with a bronze impeller. This impeller consists of a wheel revolving inside the pump-



New motor driven centrifugal pump that eliminates 32 parts.

case. As it revolves it touches only the water, and does not touch or rub against any metal part, reducing the possibility of wear. With this construction thirty-two parts are eliminated, doing away with gears, pulleys, buckets, belts and pump valves.

This electrically driven pump has a wide variety of applications. It may be used in condensation, water supply, refrigeration, circulation and heating systems. It is driven by a Westinghouse ¼ hp. motor direct connected through a flexible coupling and will pump water from wells, cisterns or streams to farms, homes or commercial buildings without the use of any tank.

Another distinctive feature of this device is that either opening in the pump may be used as the outlet or inlet by merely reversing the motor. In addition, it is impossible to overload the pump since the capacity remains nearly constant regardless of the load.

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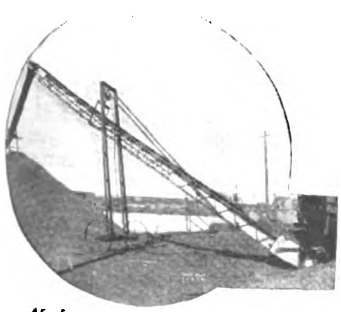
Type "A" is ideal for all sizes of Anthracite Coal and Domestic Coke. Screens and loads 1 ton of coal in less than 2 minutes. A money-earner.



Type "CA" is used for all sizes of Anthracite and Run-of-mine Bituminous Coal. Removable woven wire screens and veil plate furnished with loader. A fast, cheap worker.



The famous "Cub" Portable Belt Loader, 21 ft. length, 18-inch wide belt; all steel, one-piece channel iron frame; motor or gas engine driven.



45 ft. Portable Belt Conveyor handling coal from cars to storage. Link-Belt Portable Belt Conveyors made in a wide range of sizes to fit conditions.

Everybody Knows All About Portable Loaders—

But do YOU use one?

EVERYBODY KNOWS that Portable Loaders will load a variety of materials and do it faster than the shovel-loading way. Everybody knows that Portable Loaders WORK, and that there are any number of them in use.

What YOU would probably like to know, is just what good a Portable Loader would be in your plant. How much in actual dollars-and-cents would it save? How would it be best applied to your conditions? What type and make of machine would be best for your materials?

Users tell the saving part of the Link-Belt Portable Loader story best. Hundreds have written letters telling how they use Link-Belt machines with profit. And they cite figures to support their statements. Convincing figures. Figures that would interest every progressive executive.

Without obligation, Link-Belt engineers will be glad to give you *all* the facts you want about the use of loaders as applied to YOUR business. Just outline your present conditions and methods. Link-Belt engineers will, on receipt of your letter, tell you, without obligation, if they can help you save money in loading, and just how it can be done.

The coupon is for your convenience. Use it if you prefer.

Ind. Ill.

LINK-BELT COMPANY, 2045 HUNTING PARK AVE., PHILADELPHIA, PA.

We are interested in a ☐ *bucket belt* ☐ *loader for handling* _____

from _____ *Size of largest lump* _____

Power available for operation ☐ *gas engine* ☐ *motor* _____ *volts* _____ *phase* _____ *cycle* _____ *a. c.* _____ *d. c.*

Send us a copy of Folder No. 785.

Name _____ *Firm* _____

Street and No _____ *City* _____ *State* _____

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LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying and Power Transmission Chains and Machinery

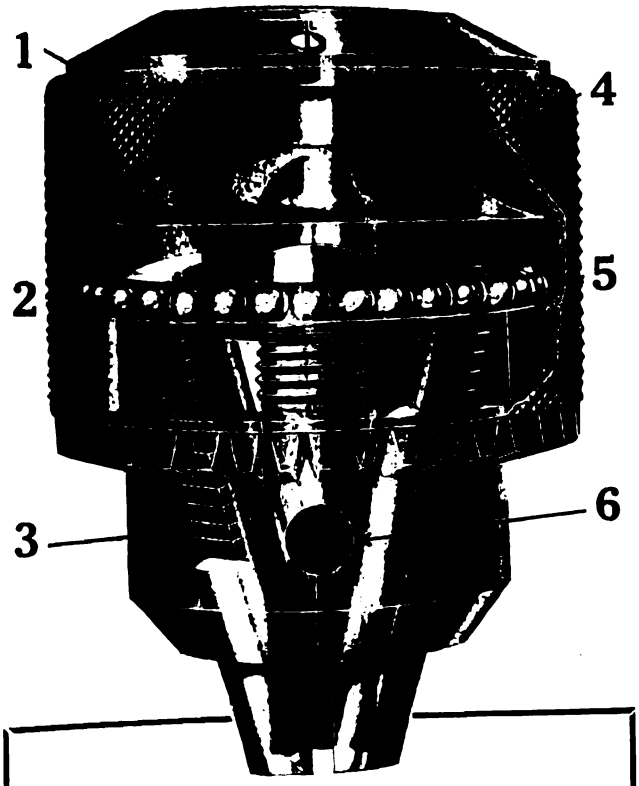
PHILADELPHIA, 2045 Hunting Park Ave. CHICAGO, 300 W. Pershing Road

INDIANAPOLIS, 200 S. Belmont Ave. Offices in Principal Centers

LINK-BELT

THIS YEAR LINK-BELT IS FIFTY YEARS OLD

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The Built in Quality of Jacobs Super Chucks

1. Ground Arbor Hole—Greater Accuracy
2. Ball Bearing—Eliminates Friction
3. Coarse Pitch 90° thread—Rapid Action, Greater Strength
4. Design of Body — Decreases Weight
5. Threaded Plug—Readily Removable
6. Body Deeply Case hardened—Reduces wear

And then in addition, all Jacobs Chucks are carefully made and rigidly inspected. Jacobs Chucks and Arbors are moderately priced, considering their quality. Securely packed in neat boxes. Ask your dealer for the New Jacobs Super Chuck.

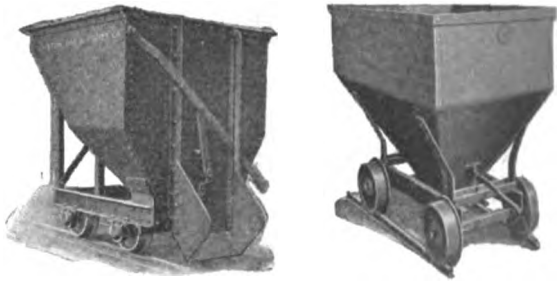
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The World's Largest Producers of "Drill Chucks"



Complete Equipment for the Industrial Railroad

Our catalogue describes 220 items, from rails and tracks to cars, bodies, etc. Write for a copy.



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200 Holley St., Easton, Pa.
Sales Offices
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EASTON CARS
FOR EVERY INDUSTRIAL PURPOSE

THOMPSON'S HACK SAW BLADES



"MILFORD" Brand—All hard tungsten steel for cutting solids such as tool steel, rails, etc.



THE WAVY SET BLADE

"MIL FLEX" Brand—The Wavy set blade Soft-back tungsten steel practically unbreakable, for cutting pipe, BX, Sheets, Conduit, etc.



THOMPSON'S Flexible Back Band Saws for cutting Metals.

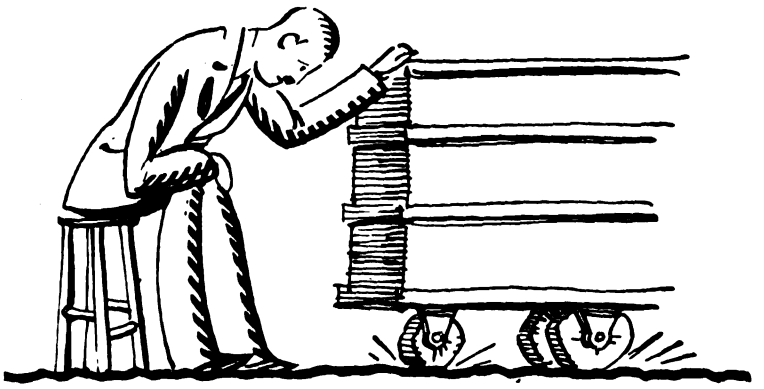
Sample band or hack saw blade sent on request.

— Manufactured by —

The Henry G. Thompson & Son Company
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New Haven, Conn., U.S.A.

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Let's get right down to this Question of truck caster wheels ?

FIRST of all, what should a truck caster wheel do?

Should it roll easily?—it should! Should it roll smoothly, take the bumps, take the knocks?—it should!

Should it roll silently, without harm to floors, without wearing itself or the floors out?—it certainly should!

Did you ever see a truck caster wheel that would do all these things? No!

Would you like to see a truck caster wheel that *is* doing each and every one of them? Yes!

Then clip that coupon you see over in the right-hand corner. It will bring you a section of a truck wheel that really does roll easily, roll silently, roll smoothly and without ruining your floors or your nerves.

"Bassick Ruboid" is the name of this unusual truck caster wheel. It is a new invention—new in design, new in materials used, new in the way it lasts, the way it wears.

Whether you are "content as an angel" or "sore as a boiled owl" with your present truck wheels, it will pay you to have a look at Bassick Ruboids. They save money as well as floors—and they last!

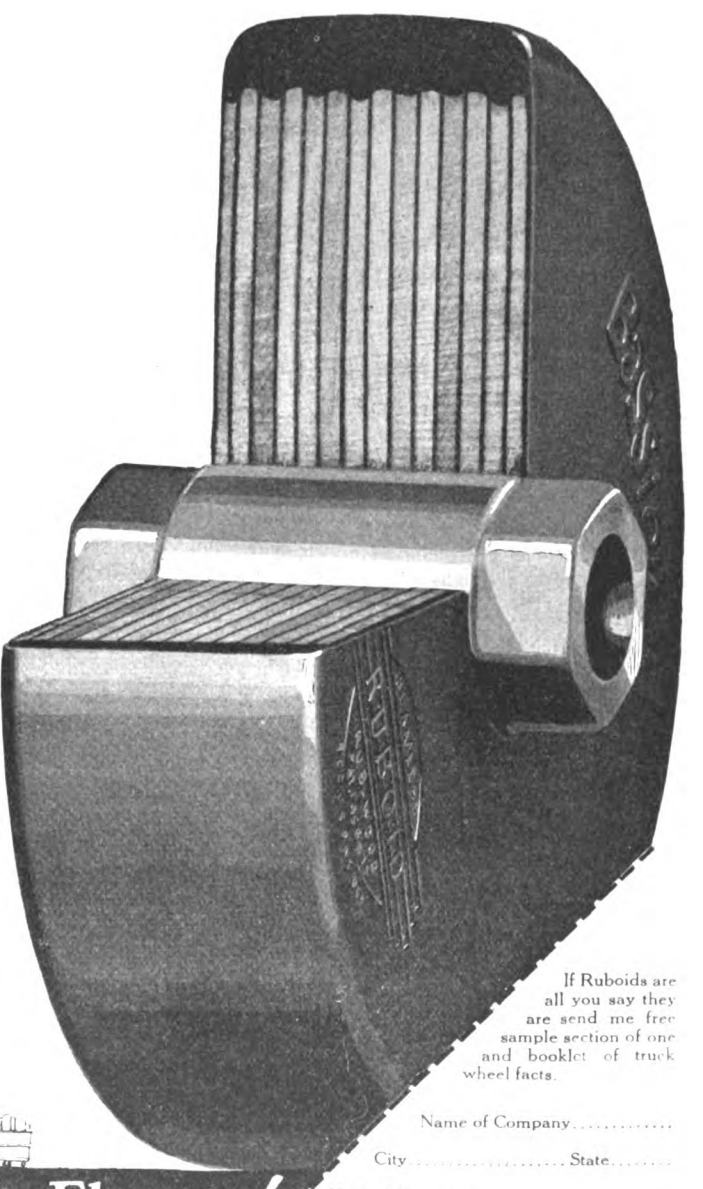
THE BASSICK COMPANY, Bridgeport, Conn.

Bassick

Reg. U. S. Pat. Off.

SEAMLESS
RUBOID
RUB-WOOD
PAT. 1458 379
REG. U.S. PAT. OFF.

No wonder it wears, wears, wears—many laminations of tough wood held fast in a solid mass of vulcanized rubber.





Ruboids Will Save Your Floors!

If Ruboids are all you say they are send me free sample section of one and booklet of truck wheel facts.

Name of Company.....

City..... State.....

Kind of Business.....

O. I. I.

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UNION
RENEWABLE FUSES



Lower the Cost of Maintenance

Insure Positive Protection Against Possible Damage to Electrical Equipment from Overloads and Short-Circuits.

HAVE you had an opportunity of examining the new and improved Union Renewable Fuse—of taking it apart, of noting the simple design and rugged construction, and of seeing how easily it is assembled?

Then—and only then—can you appreciate how Union Renewable Fuses will succeed in minimizing the cost of fuse maintenance wherever they are used. They stay in service indefinitely because the substantial construction guarantees an exceptionally large number of blowouts, and because simple design results in few parts, making easy renewal and assembly. They are fully approved by the Underwriters and are made in all standard ratings, 65 to 600 amperes, 250 and 600 volts.

Hundreds of fuse users, jobbers and dealers have seen the new Union Fuse and given it their unqualified approval, and supply houses have stocked up to take care of the great demand that has been created since the first announcement of this improved fuse.

Send in an order for your requirements and when you see one of these fuses you'll be convinced that your maintenance costs will be materially reduced.

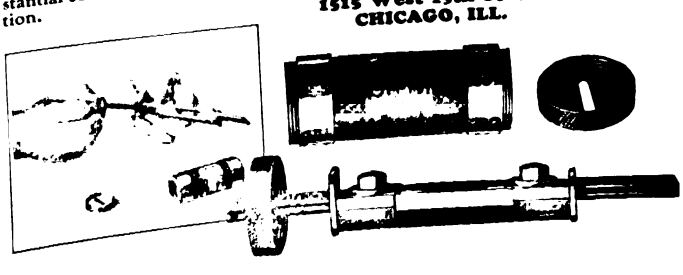
CHICAGO FUSE MFG. CO.

MANUFACTURERS OF

ELECTRICAL PROTECTING MATERIALS AND CONDUIT FITTINGS

1515 West 15th Street CHICAGO, ILL.

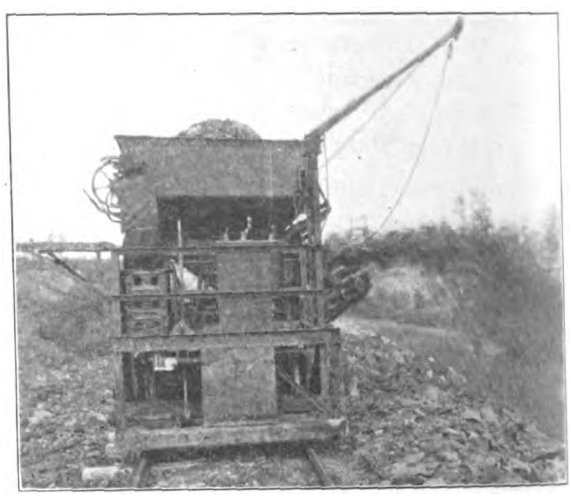
Note the small number of loose parts, and the simple and substantial construction.



Handling Refuse Material Mechanically

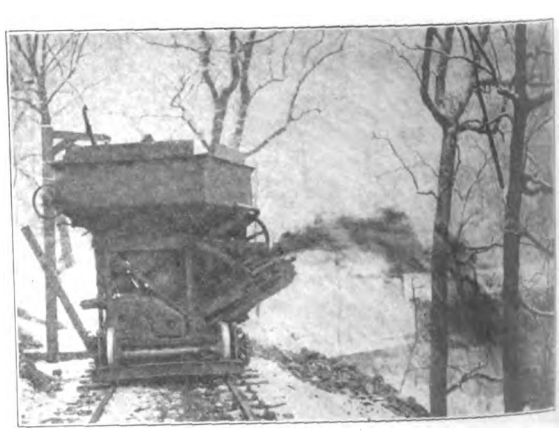
By William Greaves

IN coal mining operations the disposal of mine rock and picking table refuse is often a problem owing to surrounding topography. The car shown here enables one man to dispose of 400 to 500 tons of rock and refuse per day, often at a distance of nearly a mile from the tipple. The pocket on car has a capacity of 7 tons, which



View showing control mechanism for the refuse handling car

is discharged by a high speed manganese steel apron which runs at a speed sufficient to throw rocks weighing up to 250 lbs. a distance of 30 feet from the center line of the track. As the pocket and discharge apron are mounted on a turntable, material can be discharged to either side or straight ahead of the track; thus giving a



Front view of car showing turntable and discharge mechanism

pile 60 feet wide across the top without the necessity of shifting the track or leveling the material with manual labor. This type of equipment could also be used in a number of industrial plants, on construction work, and in other places where a similar operation has to be performed.

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75 firms in Chicago's proudest business structure, the Wrigley Building are Globe-Wernicke Office Equipment users. An endorsement from the hub of industry, where efficiency and speed are priceless!



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And now Globe-Wernicke introduces the new exclusive "off-setting" feature—the "stop" signal of indexing. It puts a new high value on centralized information.
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CINCINNATI, OHIO

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The One Horse Shay Served it's Purpose

BUT its day is gone, long, long ago. Modern life is too swift, too complex for such a transportation service to survive and serve efficiently.

Back in the days of slower production, of only fair quality in products, hand regulation of heat processes was good enough. But the demands of industry today cannot be met with makeshift methods and fair quality goods; only the best are wanted. And large scale production is absolutely necessary if competition is to be met.

Tycos Indicating, Controlling and Recording Instruments are first aids to absolute certainty in temperature control and indication. Plants the world over are producing goods based on *Tycos* readings safe in the knowledge that they are guarded by scientific control.

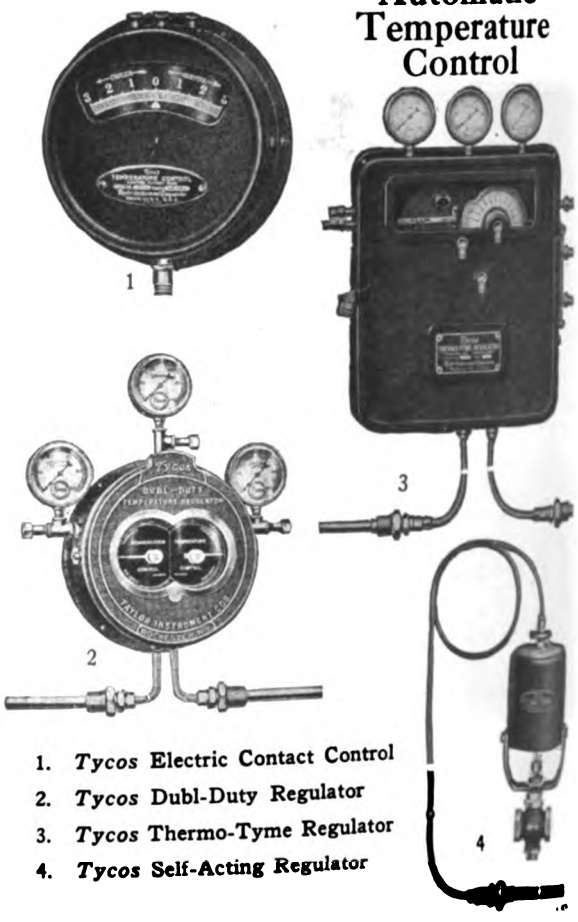
You too can eliminate rejections due to over or under heating, can insure the uniformity of your product, can cut down process cost and increase your production by installing Tycos control. For *Tycos* serves your industry as it does all others. Write for a catalog that applies to your product.

Taylor Instrument Companies

Rochester, N. Y., U. S. A.

Canadian Plant *Tycos* Bldg. Toronto

Tycos Automatic Temperature Control



1. *Tycos* Electric Contact Control
2. *Tycos* Dubl-Duty Regulator
3. *Tycos* Thermo-Tyme Regulator
4. *Tycos* Self-Acting Regulator

Tycos Temperature Instruments

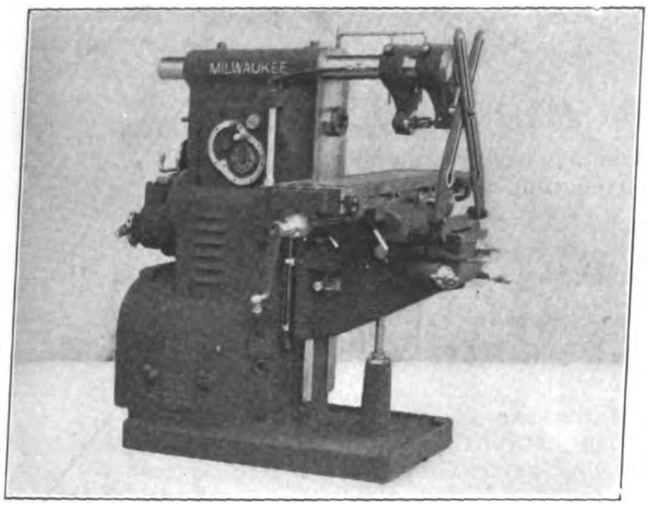
INDICATING · RECORDING · CONTROLLING

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New Motor-in-the-Base Milling Machine

KEARNEY & TRECKER CORPORATION, Milwaukee, Wisconsin, has recently placed upon the market its new Motor-in-the-Base milling machine. The drive is direct through steel hardened gears.

The motor is housed in the lower part of the column. Suitably placed louvers provide ample ventilation and adequate provision has been made at the outside of the machine for lubricating the motor bearings.



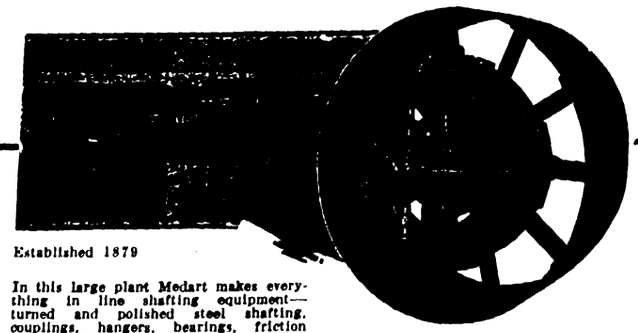
The drive is through a newly designed friction clutch, with the control lever brought out to the front of the machine. This control lever may be adjusted to whatever angle is most conveniently swung out of the way for very large work.

A "built-in" power rapid traverse to the table forms another improvement on this new miller.

THE faith of both investors and speculators in the strength of industry in general is shown by the present high prices of the stocks of many industrial concerns. Railroad shares, in comparison, are practically neglected, as their earning power is limited under the control of freight and passenger rates by the Interstate Commerce Commission.

The incentive that underlies the current demand for industrial stocks is found in the increase of industrial earnings in the second quarter of this year over those of the first quarter. These increased earnings indicate how well industrial enterprises in general are getting on despite the handicaps in some lines.

There will not be any lack of funds this fall to support further business expansion. Time money is around 4 per cent. and call money commands about the same price, although both may firm up somewhat with the increase in the demand for funds for crop-moving purposes. However, the old-time annual fall stringency of loanable funds has largely disappeared with the coming of the Federal Reserve System.—*La Salle University Bulletin.*



Established 1879

In this large plant Medart makes everything in line shafting equipment—turned and polished steel shafting, couplings, hangers, bearings, friction clutches, five types of pulleys, gearing and kindred appliances.

The Clutch That Clutches!

Because it possesses (1) large starting capacity and (2) great mechanical stability, Medart V-Groove Friction Clutches are ideal for general transmission work. By their use, judiciously placed, line shafting equipment can be so divided into units that easy and quick control of the various departments is accomplished with resultant money-saving, convenience and safety benefits.

Medart Clutches possess these fundamental advantages—simplicity of construction, ease of adjustment and positive action. No springs, cams or intricate apparatus are employed. Supplied either solid or split construction, as desired, the Medart can be used either as a clutch cut-off coupling or as a clutch integral with a pulley, gear, sheave or sprocket—so that either a department, a line shaft, a countershaft, or a machine may be placed under separate control. The thousands of Medart Clutches in use give testimony to their splendid utility and satisfactoriness. Ask for Booklet "The Clutch That Clutches," and specify Medart on your next Friction Clutch order.

MEDART

Everything in Line Shafting Equipment

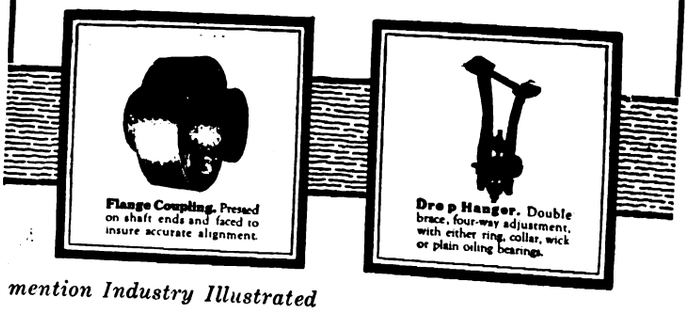
Besides clutches, Medart makes a complete line of Power Transmission equipment. Concentrate your purchases and fill all your transmission requirements, through Medart Catalog 43, with discount sheet. This affords a simple, direct method of economical buying. Engineers' estimates furnished on your specifications without obligation.

THE MEDART COMPANY

(Formerly Medart Patent Pulley Co.)

General Offices and Works, St. Louis, U. S. A.

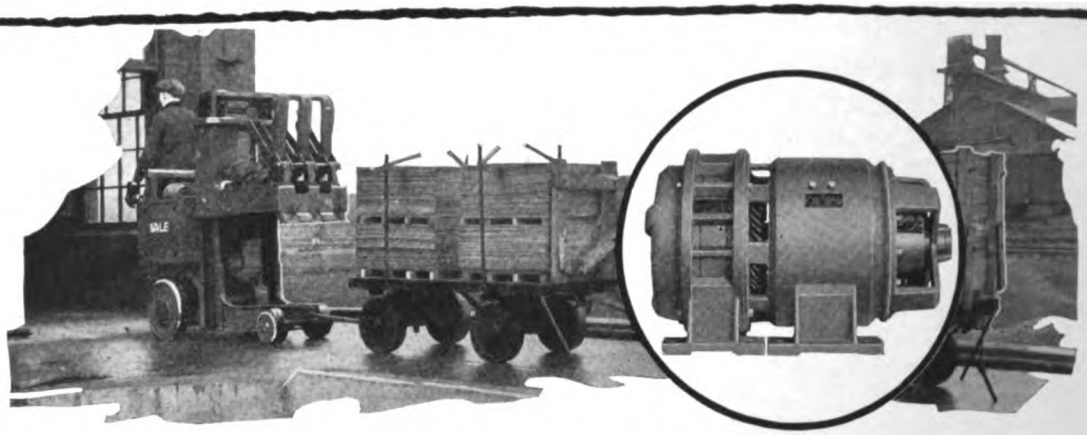
Offices in Chicago, Philadelphia, Pittsburgh and New York
Office and Warehouse in Cincinnati



Flange Coupling. Pressed on shaft ends and faced to insure accurate alignment.

Drop Hanger. Double brace, four-way adjustment, with either ring, collar, wick or plain oiling bearings.

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Yale Trucks Thrive on Hertner Charging

Their appetite for work is whetted by the pep which they must receive from your charging plant

HERTNER CHARGING EQUIPMENT

will keep your Yale or other equipment at top notch efficiency.

Our Individual and Multiple Motor Generator Sets are designed to accurately supply your needs as to charging rate, amount of equipment and proper locations for charging.

If you are using or contemplating the use of intra-plant trucking equipment, consult our Service Department for their suggestions on the type of charging equipment to meet your particular needs.

The HERTNER ELECTRIC COMPANY
W. 112th. Street Cleveland, Ohio U.S.A.

Save 75% of Your Material-Handling Costs

POWERED with the factory-built Baker motor guaranteed to operate over a longer period at higher overload than any other motor vehicle equipment, equipped for greater convenience with either roll-over V type or end dump body and possessing structural advantages found in no other industrial machine, the Baker Dump Truck handles bulk material like coal, ashes and waste at 25% of the cost of hand trucking.

Bulletin No. 26 describing the complete line of Baker industrial tractors, trucks and cranes is sent promptly on request. Write for your copy today.

THE BAKER R & L COMPANY
Cleveland, Ohio

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.
Baker



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New Motor Truck Unit Transportation System

IN keeping with the ever increasing tendency toward coördinated transportation, Mack Motor Truck engineers have developed a unit system which differs materially from any other yet devised.

The primary purpose of this system is to eliminate the many handlings of general freight necessary under the old methods of shipping, thereby materially reducing the idle expense on all forms of transportation equipment by releasing rolling stock—truck or freight car—for service twenty-four hours per day.

In transporting freight between two points located some distance apart, it is the customary practice to load it onto a motor truck, unload at a freight terminal, reload to a railroad car and reverse the process at the destination; in each case, holding up both the truck and freight car for an unwarranted period.

With the new Mack Unit, all unnecessary handling is eliminated, and since the special containers can be loaded

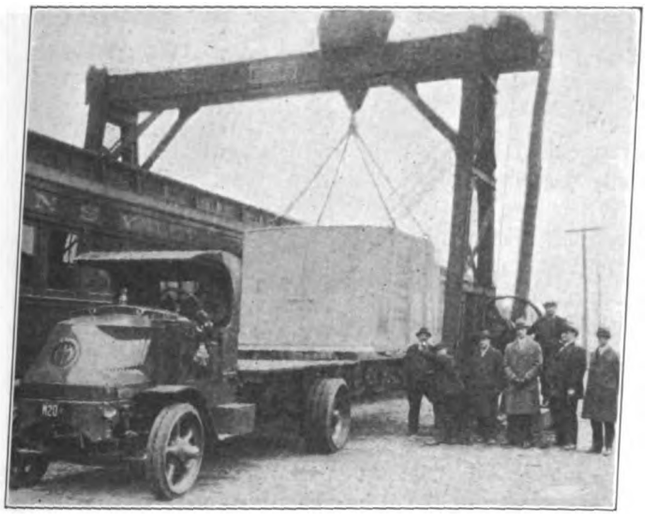


Fig. 1. Unloading the Mack Aluminum container by crane at the freight terminal.

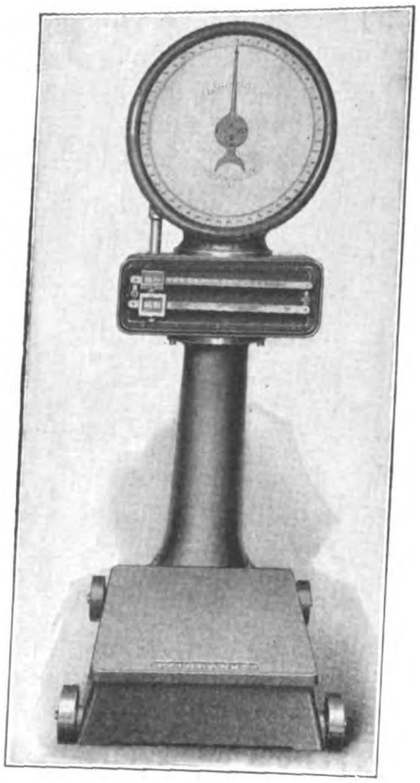
during the truck's absence and transferred from truck to freight car in a very few minutes, the rolling stock is not held up at any time.

It is stated that, in making transfers, the ramp-track method, which is the main feature of the system, is much faster than a crane, and that in receiving or delivering a load, the entire operation can be handled by the driver, unassisted and without his leaving the cab.

The ramp-track is a simple, inexpensive structure, available in various forms to meet all loading conditions; the forms ranging from "one way back-in" types for trucks to the large trucks, equipped with transfer carriers and capable of loading or unloading an entire train of flat cars in a few minutes time. When the transfer carriers are provided, any one container may be picked out of the middle of a train and exchanged for another on a truck or dock.

The containers are 12′ 8″ long, 8′ wide, and 7′ high, outside dimensions. Each has an internal capacity of 550 cubic feet and a safe load capacity of 15,000 pounds. As they are constructed almost wholly of high grade aluminum which combines lightness with strength, the tare weight of each is but 2,360 pounds. One unit con-

FAIRBANKS SCALES



Accuracy and Speed in Weighing

The Fairbanks Automatic Dial solves the problem of quantity weighing with accuracy and speed. The dial is so arranged that the weight is read without additions or calculations.

Weights are read at a glance and errors are practically impossible. Fairbanks Scales represent the highest development of almost a century of specialized experience. In hundreds of applications they are giving flawless service—are speeding up production, eliminating errors, saving labor, paying for themselves in countless ways.

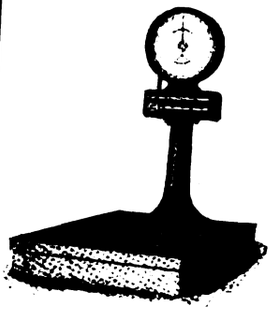
Write for bulletin information on the various types of Fairbanks Scales.

FAIRBANKS SCALES

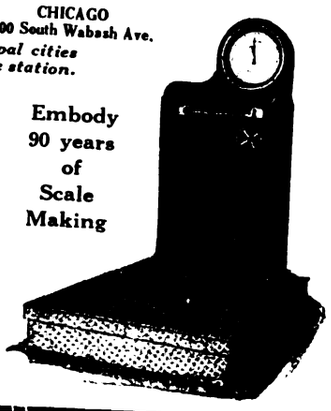
NEW YORK
Broome and Lafayette Sts.

CHICAGO
900 South Wabash Ave.

And 40 other principal cities —each with a service station.



Embody 90 years of Scale Making



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Victor Hack Saws

Try our

New Special Flexible Blade

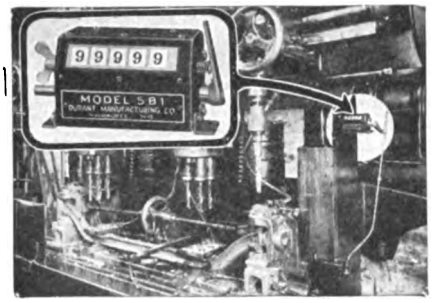
We want you to try our new blade and use it on materials and under conditions that have been producing your greatest breakage.

FREE SAMPLE BLADES

Tear out part of this advertisement and enclose it with your letterhead for sample blades.

VICTOR SAW WORKS, Inc.
Middletown, N. Y.

R



"By attaching your machine to our multi-spindle drill presses we are doing away with all hand counting and confusion that used to exist in keeping track of production.

The Productimeter
The Speedometer of Industry

"The Productimeter records automatically each axle at the completion of this operation saving one handling of the part. It has also helped speed up production."

This is a concrete instance of how the Productimeter reduces costs. Let us send you at least one for 30 days' free trial.

DURANT Manufacturing Company

608 Buffum St. Milwaukee, Wisc.

1748D

stitutes a load for a 7½-ton Mack truck; three being a load for a 40-foot flat car.

For the convenience of users who require a smaller container, they are also made in half sizes, but the same method of loading and unloading applies. These smaller units are of such dimensions that they enter the door of a standard box car, and by means of a reversible wheel

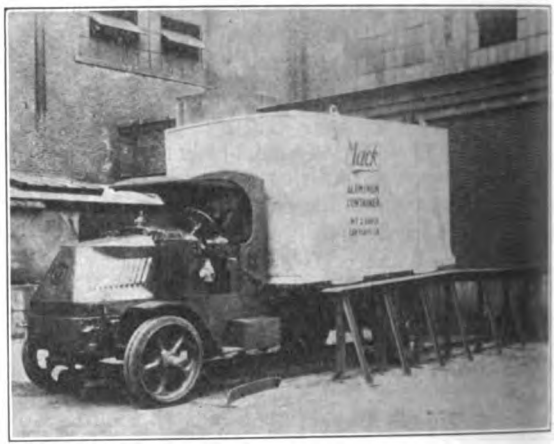


Fig. 2. The "one way, back-in" arrangement. This, the simplest type of ramp-track is very practical for shippers requiring a limited number of container units.

arrangement underneath the container, they may be easily moved to either end of the car.

When fitted for use with containers, the trucks have a coupler installed in the center of the platform, directly behind the cab, and a locking device at each of the corners. None of the equipment interferes in any way with the use of the truck for any purpose other than the carrying of containers. The platform is floored and stake holes are provided to make possible conversion to a stake body on short notice.

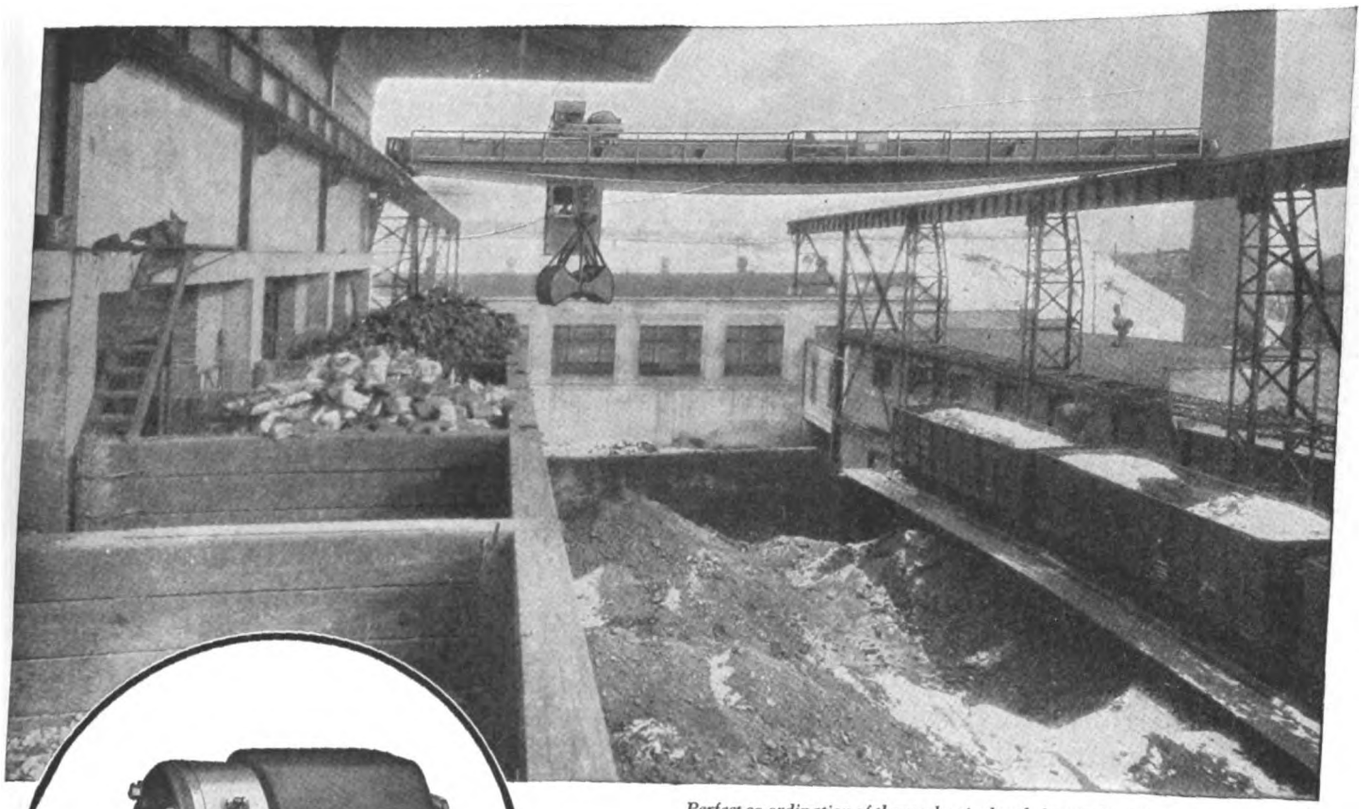
REPORTS from other countries indicate increasing activity in the direction of standardization in mechanical, electrical and other lines. Progress has been marked in some of these countries, and especially so in the case of nations which are among our keenest competitors in foreign trade.

Along with the news of this trend, there comes an uneasy question to the minds of many American manufacturers: "Will we be able to determine our own future production, or will it be dictated by the practices of industries of other nations?"

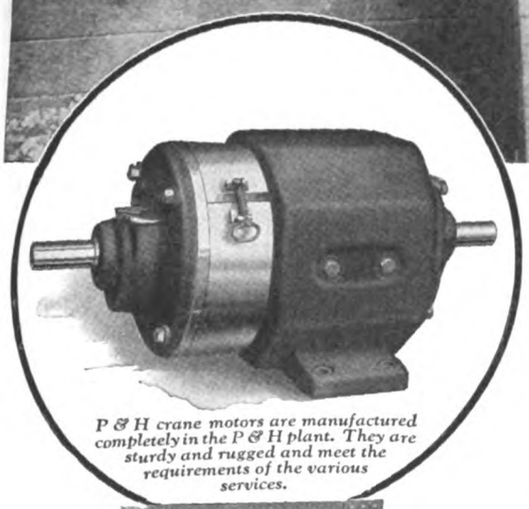
The answer is up to the American producers and American technical organizations set up to carry on standardization work. Progress *is* being made, but not as rapidly as it might be were every manufacturer, every trade association, and every engineering, scientific or business school to put their shoulders to the wheel. There is a crying need to "sell" the idea of standards and their advantages and to wage an intensive campaign in this direction.

One of the most important steps preliminary to standardization is Simplified Practice. It offers a short cut to benefits for the manufacturer, the distributor or the consumer. With coöperation by producer, distributor, user, and the technical and scientific bodies in weeding out the excessive, obsolete and unnecessary sizes, patterns and dimensional differences, a long step forward has been taken.—*Department of Commerce Bulletin*

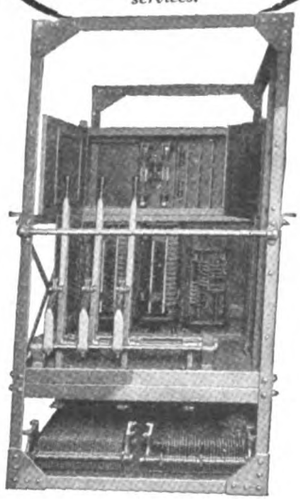
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Perfect co-ordination of the mechanical and electrical equipment of P & H cranes gives better service and longer life in all classes of work. Also economical operation and low maintenance.



P & H crane motors are manufactured completely in the P & H plant. They are sturdy and rugged and meet the requirements of the various services.



The steel operator's cab shown with cabinet doors open is exceptionally roomy and carries the controllers and protective panel, which are enclosed in a dust and moisture proof cabinet. The entire arrangement is convenient, safe and accurate.

Motored for the Job

ONE reason why P & H traveling cranes perform exactly the way you want them to is because they are motored for every job. That means the motors are designed, built and selected to function properly under the varying degrees of speeds and have the ruggedness required for every operating demand.

Obviously, the P & H organization is never influenced by selections because of price or delivery. All motors and control apparatus are built entirely in the P & H factory, providing complete control of the electrical manufacturing. The source of supply parts is right in our plant.

And bear in mind, you reduce the amount of money tied up in a supply of parts for emergency—P & H carry this investment for every client by maintaining large and full stocks for immediate deliveries.

HARNISCHFEGER CORPORATION

Successor to

PAWLING & HARNISCHFEGER CO.

CRANE AND HOIST DIVISION

Established in 1884

3850 National Ave., Milwaukee, Wis.

New York, Philadelphia, Atlanta, Dallas, Jacksonville, Birmingham, Pittsburgh, San Francisco, Kansas City, Detroit, Minneapolis, Chicago, Portland, Memphis, Los Angeles, Seattle

P&H CRANES and HOISTS

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Jones
Industrial Gears

YOU can depend always on getting a little better service from Jones Industrial Gears.

Created with the best of materials and endowed with exceptional standards of design and production facilities, they represent the unusual in modern gear manufacture.

No matter what kind of a gear you want, you can get it from us—when you want it.

Send for Catalogue No. 30 containing 205 pages of practical gear data.

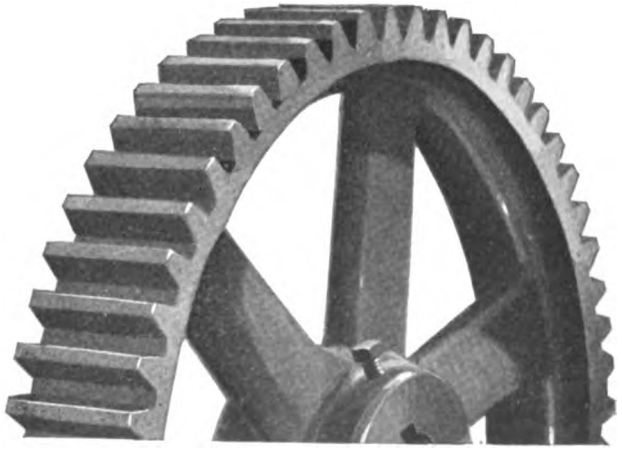
W. A. Jones Foundry & Machine Co.

Main Offices and Works:
4412 West Roosevelt Road, Chicago, Illinois

Pacific Coast Representatives:
The King-Knight Company, San Francisco, Los Angeles, Seattle

Branch Sales and Engineering Offices:

New York	Pittsburgh	Cleveland
393 Seventh Avenue	Union Trust Bldg.	226 Superior Ave., N. W.
Buffalo	**Milwaukee**	**Detroit**
296 Main Street	425 East Water Street	137 E. Woodbridge St.



What Hoover Thinks of Advertising

Extracts From His Address to the Associated Advertising Clubs of the World at Houston, Texas

NO matter how fine an addition to human comfort or pleasure a given article or service may be, unless there is a diffusion of knowledge and information with respect to it, it will not itself become quickly accepted and incorporated into our standards of living. Our standards of living are much higher today than they would have been were it not for the part played by advertising.

These standards of living are sort of built up in layers. The lower layers are the plainest food, clothing and shelter. Primeval nature herself stirs up enough emotions through hunger, cold and storms to keep "desire" vividly active in this end of the scale of living. But the moment we have got beyond this stimulus the advertiser has full swing in stimulating "desire" for better food, better clothing, better shelter, entertainment and so on over the whole range of the ten thousand and one things that go to make up superimposed layers of rising living standards. These upper layers have been added to, widened, and become more general because of advertising.

The greatest single addition to our living standards in a generation has been the automobile. It has increased our national efficiency, stretched our national vision, improved our national health, and it has added some per cent. of sheer joy, some dangers, and much excitement to life. I cannot believe for a moment that we should have had such a diffusion and such a general application of this great invention had it not been for the force of advertising. It would no doubt have crept slowly into use over a few centuries if we were without this powerful agency, as did the first revolutionary discovery in transportation—the wheel cart. The news and use of that great invention traveled only as fast as some neighbor saw it with his own eyes.

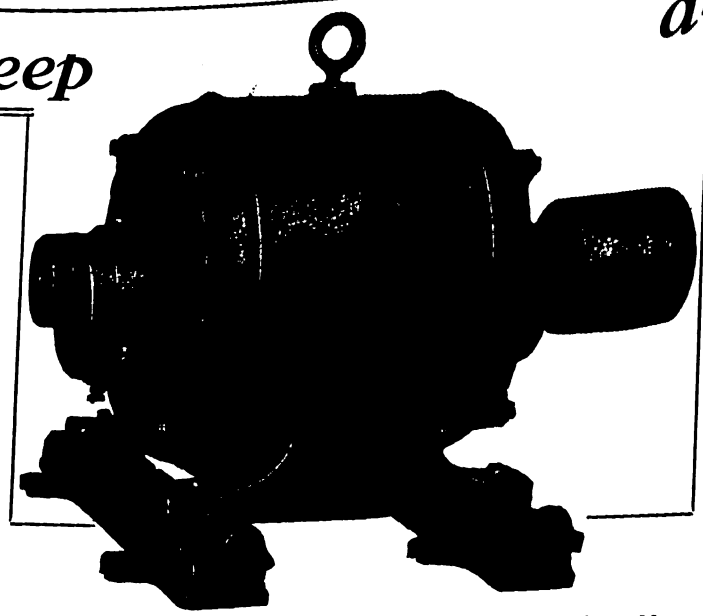
One profound economic effect of advertising is oftimes overlooked—its influence upon production. The general knowledge and rapid distribution of an article, which can only be accomplished through advertising, creates large production and thus lower costs and prices. Modern advertising is the handmaiden of mass production. Moreover, your convincing announcements of a multitude of improvements on everything spreads a restless pillow for every competitor and drives him to further and faster exertions to keep apace.

There is still another phase of advertising that has always interested me, and that is the impulse advertising has given to the distribution of news, information, good cheer and educational material to our people. Obviously, were it not for the vast extension of national advertising, we should never have had the fine development of our periodical magazines; and were it not for the growth of local newspaper advertising, our publishers would not be able to produce the great journals which are of such incalculable value.

Some say that without advertising the subscriber would carry the burden; that is, he would pay the largely increased price necessary to support a publication which did not contain advertising. But all this is disproved by a simple test; publications which attempt

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"They Keep a-Running"



10 Horse Power Century Squirrel Cage Induction Polyphase Motor

Long-life Bearings

The bearings of Century Squirrel Cage Induction Polyphase Motors stand up for years under heavy service requirements. They are built to exactly the same specifications as the bearings in other Century motors—many of which have been in continuous daily service for over 20 years without a single bearing replacement.

1. Only the highest grade cast phosphor bronze bearing metal is used in Century motor bearings. They are cast in electric furnaces in the Century plant.
2. They are machined overall to micrometer dimensions and provided with machine-cut figure 8 oil grooves which insure thorough oil distribution.
3. Bearings are liberally proportioned to withstand the pounding of gear drive and pressure from unintentionally heavy belt tension.
4. Lateral shifting is prevented by a heavy shoulder on one end of the bearing.
5. Throughout the life of the motor, the bearing housings remain as nearly dust tight as it is possible to build them.

Built in all standard sizes from ¼ to 50 horse power—temperature rise not more than 40° Centigrade.

Send for Bulletin 38

Bulletin 38 describes the complete assembly details of Century Squirrel Cage Induction Polyphase Motors. Send for your copy today.

CENTURY ELECTRIC COMPANY
1806 Pine St. St. Louis, Mo.

For More Than 22 Years at St. Louis

¼ to 50 H.P. **Century MOTORS** ¼ to 50 H.P.

When writing advertisers please mention Industry Illustrated

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SARCO STEAM TRAP No. 9 is New and Better

It is factory adjusted for any steam pressure from 0 to 100 lbs.

It has merely to be screwed on the end of any steam line in an upright position. It requires no leveling or careful installation.

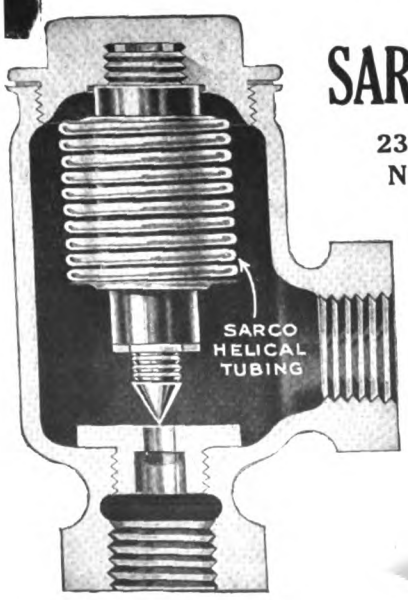
It is thermostatic and cannot air-bind. Air opens the trap, just as water does.

It has no toggle joints to stick or clog—just one moving part.

It does not choke with dirt because it has a wide open discharge twice the size of the average opening in small traps.

It has large capacity and costs less than bucket or float traps.

Write for Booklet R-266 and our free trial offer.



SARCO CO., Inc.

236 BROADWAY
NEW YORK CITY

Boston
Buffalo
Chicago
Cleveland
Detroit
Philadelphia

Peacock Bros., Ltd.,
Montreal

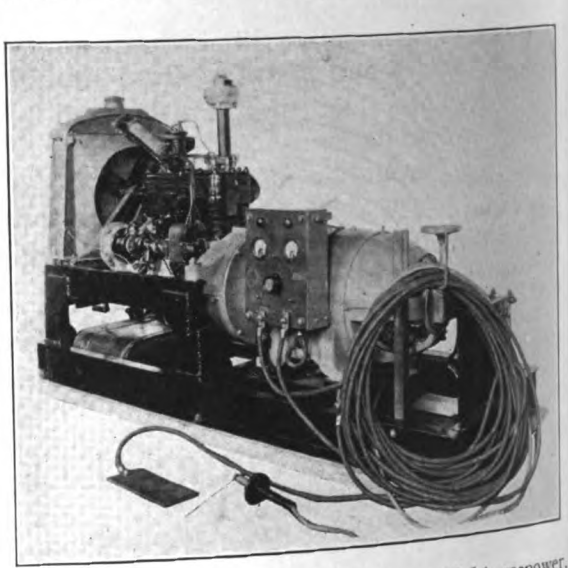
to circulate without advertising seldom go far and generally fail.

The notion that advertising in its broad sense is an economic waste has been long since abandoned. I have already mentioned its social use in advancing standards of living and its economic influence upon mass production and thus its contribution to lowered costs. More directly it is an economical form of distribution. The steady increase in volume of advertising in our news and periodical press is only one proof that it is such an economical form of distribution, for if it did not secure greater results at less expense it would decrease, not increase. The consumer, searching for article or service, turns to the advertising columns of our press to learn just where to go after it, and so avoids the waste motion and loss of time and strength involved in blind search for fulfillment of his desire. All these things eliminate waste motion and time.

A New Engine-Driven Welding Outfit

A NEW engine driven welding set has recently been added to the General Electric line of welding equipment. This outfit consists of a standard WD-12 welding generator driven by a Buda engine, all mounted on wooden skids to facilitate moving from place to place.

The engine is a Buda model WTU, especially designed for heavy duty. It is a four cylinder, four cycle machine of the "L" head type, with 3¾ inch bore and



5⅛ inch stroke. The S. A. E. rating is 22.5 horsepower, and at 1,400 r.p.m. the actual brake horsepower is 33.

The new outfit is being marketed complete with all accessories and ready for use. This unit should be of value in locomotive repair work at roundhouses; in the construction of pipe lines and tanks and in repairs in oil fields; in ship repairs, either at the dock or by welding barge, or in any industrial plant or on any construction job, where electric power is not available.

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PYOTT
Transmission Equipment



PYOTT *Redface Pulleys*

Pyott Red Face Pulleys are perfect, symmetrical in appearance, accurately balanced, strong, and in every detail bear out a long established standard for quality. Every facility for maintaining quality is employed by the Pyott Foundry Company.

Materials are selected with great care. Accurate machining by experienced men and systematized methods of production are responsible for producing a quality article at a price no higher than that charged for inferior products.

We carry a large stock of pulleys on hand for immediate shipment. Special sizes and styles can be had in from three days' to a week's time. Cast Iron pulleys are all made to order. We solicit your orders on the basis of quality and dependable service.

PYOTT FOUNDRY CO.
328 NORTH SANGAMON ST.
CHICAGO, ILL.

Manufacturers of
Pulleys, Sheaves, Sprocket Wheels, Moulded Tooth Gears, Fly Wheels, Power Transmission Machinery, Grey Iron and Semi Steel Castings.

PYOTT FOUNDRY CO.

This Book Tells the Story



6 Points of Extra Value at No Extra Cost
Here are 2

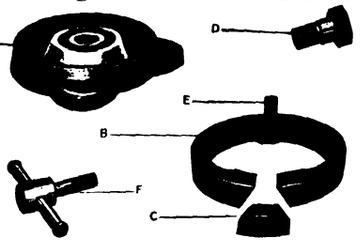
Steel Jaw Construction

"Close Up," showing the careful milling and fitting used in our jaw construction. The Jaws are pinned on and cannot work loose, but are removable if necessary. This has been a Parker feature for 84 years.



Swivel Base that HOLDS

By tightening up Wedge "C" with Bolt "F", Ring "B" is expanded against the side walls of Base "A" with a full 360° grip that makes the Parker Swivel Base as firm as a stationary base.



Send for our new Catalog No. 57B, showing all the Parker Features. Address, Attention W. R. B.

THE CHARLES PARKER CO.
Master Vise Makers
MERIDEN, CONN., U. S. A.

PARKER VISES

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Call in the man who uses valves



Fig. 106.— Screwed, Jenkins Standard Bronze Globe Valve.

Ask him about Jenkins Valves.

Ask him how they compare in point of service with other makes. See if he hasn't found them entirely reliable, giving years of trouble-free performance, where inferior, poorly constructed valves have failed.

Wouldn't it be a good idea, then, to standardize on Jenkins Valves for all replacements and wherever new valves are needed?

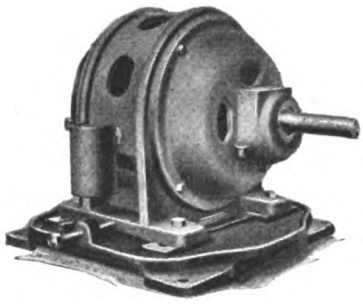
Supply houses everywhere carry genuine Jenkins Valves.

JENKINS BROS.

80 White Street.....New York, N. Y.
524 Atlantic Avenue.....Boston, Mass.
133 No. Seventh Street...Philadelphia, Pa.
646 Washington Boulevard...Chicago, Ill.

JENKINS BROS., Limited
Montreal, Canada London, England

Always marked with the "Diamond"
Jenkins Valves
SINCE 1864



New DIEHL Alternating Current Motor

The latest addition to the line of Diehl alternating current motors is the type I D. Many exclusive features of approved electrical and mechancal construction are to be found in this new motor. Diehl engineers will gladly work with you on your motor problems.

Write for descriptive bulletins—now.

DIEHL MANUFACTURING CO.

ELIZABETH N. J.

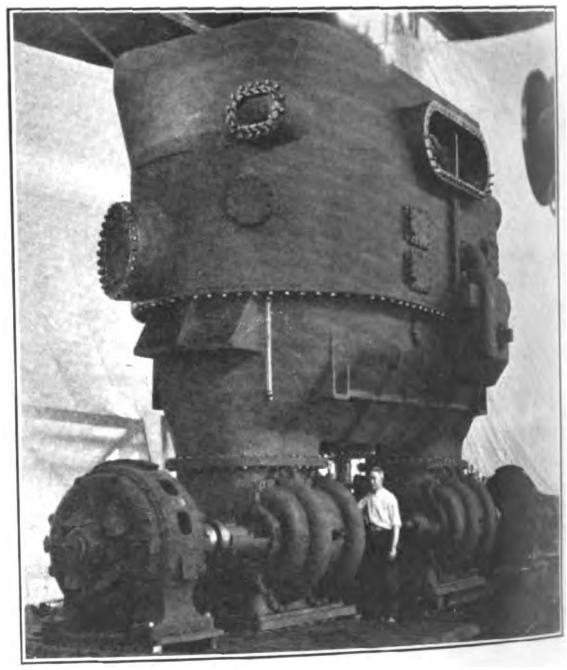
ATLANTA BOSTON CHICAGO DETROIT NEW YORK PHILADELPHIA

BUILDERS OF MOTORS AND FANS SINCE 1888

DIEHL

The Biggest Single Jet Condenser Ever Built

THE largest Single Jet Condenser ever constructed is that manufactured by the Elliott Company for the Narragansett Electric Lighting Company, of Providence, R. I. This condenser, which serves a 35,000 kw. turbine, and uses 36,000 gallons of water per minute, is pictured below. Heretofore, it has not been considered feasible to construct such large condensers in other than twin units, whose steam inlets were connected to the turbine exhaust by means of a "Y" fitting. In other words, two condensers of 17,500 kw. capacity were used to make a 35,000 kw. combination. Such condensing systems were complicated and extravagant in the use of the small space available under the turbine. Both elements of the twin unit had to be cross connected for water, exhaust steam, and air. These cross connections involved the use of large piping, so that such twin condenser installations were necessarily bulky



and inaccessible due to the mass of tortuous cross connections that had to be gotten into a small space.

The photograph shows convincingly how much better the single large condenser is adapted to the service, than the complicated twin type. The single condenser is clear cut and there are no cross connection pipes of any kind the contour of the unit is such that it fits the space naturally left by the foundation structure; the shape of the condenser body is approximately that of the turbine exhaust, so that the installation problem is reduced to its simplest form. By having two extraction pumps, all the possible advantages of a twin condenser are realized without having any of the twin disadvantages.

Note the least interesting feature of the installation is that the distance between the turbine floor level and that on which the condenser rests is only 20 ft. 3 in. This is unusually low.

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Four proved suggestions for *Cutting Maintenance Costs*

Many of the leading industrial plants in this country have reduced the amount of money it takes to keep their buildings in repair. This page tells how they do it.



Photo by MacGregor & Vallin

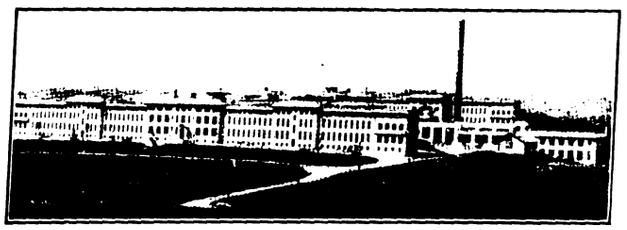
Above is the world's largest body plant—the Fisher Body Company, Detroit, Mich. The concrete floors of this plant are dustproof, wearproof, waterproof, for the entire floor surface has been treated with Lapidolith, the liquid chemical floor hardener.



Photo by Wurts Bros.

No matter how hard it rains, water cannot seep through the walls of the Commercial Cable Building at Far Rockaway, Long Island (at left). The exterior surface has been thoroughly waterproofed by an application of Hydrocide Colorless.

The snow-white exterior of the State Tubercular Sanatorium at Hamburg, Pa. (below), owes its refreshing appearance to 3000 gallons of Exterior Cemcoat, the paint that stays white.



FLOORS—You seldom see that concrete floors are wearing until the actual need for repairs is close at hand. Then it is too late to forestall maintenance expense.

The first outward sign of floor wear is silicate dust that fills the air and damages equipment, merchandise and machinery. Holes, hollows, cracks and worn patches quickly follow in its wake and then you have some repairing to do or a new floor to lay. If you take the floor in time, however, and treat it with Lapidolith, the liquid chemical floor hardener, you will have a floor that is permanently dustproof and wearproof.

Lapidolith penetrates the concrete quite a distance. By chemical action the loose coarse-grained particles are changed to a fine, even, close-grained substance of crystalline formation. This substance is flintlike in its hardness. It needs no further attention for years, no matter what kind of wear it gets. Lapidolith is simple to apply. It can be flushed on either a new or old floor and if applied at night the job is complete by morning.

If your floors are of wood, do not bother with messy floor oils that merely lay the dust and have to be applied again and again. If you would really prevent floors from rotting, splintering and drying out, treat them with Lignophol, the preservative floor dressing that restores the natural oil and gum of the wood. Lignophol is non-inflammable; one application lasts for many years and keeps floors smooth, hard and sanitary.

PAINTED SURFACES—Painting is one job a plant must always do, but how often is another story. Interiors and exteriors require less painting where Cemcoat is used. This gloss, eggshell, or flat enamel paint stays white long after other paints yellow with age. A Cemcoat interior looks bright and cheerful. It can be washed over and over again, and each time the paint shines forth as bright and clean as when it was applied.

Cemcoat does not crack or peel even on a brick or concrete wall. It is not affected by free lime—always found in such a wall—which quickly spells the finish of most paint. Cemcoat is made in white or colors for both interiors and exteriors.

EXTERIOR WALLS—If moisture seeps through your walls in a driving rainstorm, coat them with Hydrocide Colorless, the perfect waterproofing for brickwork. It does not impair their natural beauty in the slightest. Hydrocide Colorless is applied on the outside of a building, but its presence cannot be detected. It penetrates the brick. It contains no paraffin, and hence does not run in hot weather; it does not collect dust; it can be painted; it keeps buildings permanently dry and warm.

ROOFS—If your roof leaks, Stormtight will quickly and permanently make an end of the trouble.

This thick, elastic, rubber-like compound adheres to any surface, wet or dry. It can be applied by anyone over any roofing material.

Either a small leak, or a large one, can be repaired with but little expense of time or trouble and at small cost. At the same time an entire roof surface can be made lastingly waterproof with Stormtight. Many an old roof about due for replacement has been made as good as new by an application of Stormtight, thus saving the owner the cost of re-roofing.

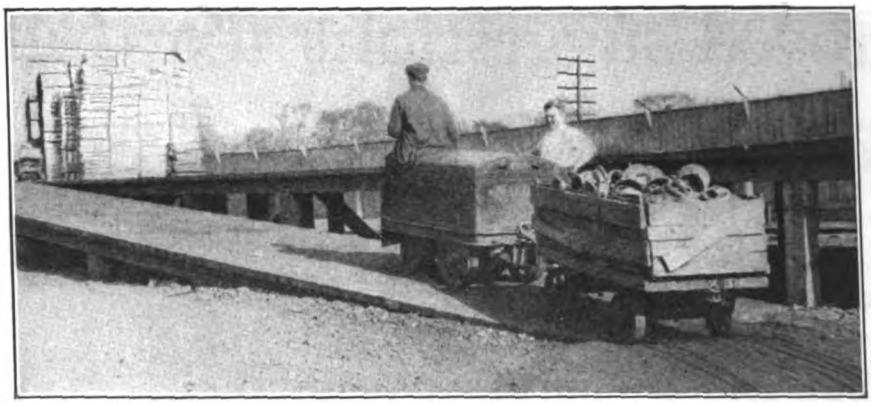
For years the leading industrial plants of this country—such plants as Ford Motor, Standard Oil, Bethlehem Steel, Swift & Company—have kept down their maintenance costs by using some or all of the above products. It will pay you to know more about these products. Sign the coupon below and return it to us today for free sample and complete information.

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Please send me, without any obligation, demonstration sample and literature on:—
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Controlling the cost of operating Electric Industrial Trucks and Tractors

MANY of the most prominent manufacturing concerns have singled out one particular storage battery for use in their electric industrial trucks and tractors.

Whether you operate one industrial truck, a few trucks and tractors, or a large fleet, it will pay you to know how and why the Exide-Ironclad Battery enables manufacturers to handle more material at less cost than was possible before they became battery-wise.

The increase in tons moved is directly traceable to the ability of the Exide-Ironclad Battery to haul heavy loads at good uniform speed. This battery, with its reserve power, drives heavily loaded trucks and tractors over all sorts of pavements and grades, releasing current in a flood when needed without injury to the plates.

The continued high voltage of the Exide-Ironclad Battery throughout the period of discharge keeps up the speed of the truck even late in the afternoon. When the battery approaches full discharge, the decrease in its voltage is not sufficient to decrease noticeably the speed of the truck.

Men who are responsible for the operation of large fleets of industrial trucks and tractors can tell you that the Exide-Ironclad Battery is economical to recharge, easy and inexpensive to care for. They know that this rugged battery seldom sees the repair bench and gives years of continuous service in electric industrial trucks.

Best of all, the battery that supplies sufficient speed and power to insure prompt handling of material, the rugged, durable, repair-free Exide-Ironclad Battery, stands up for years in electric industrial trucks and tractors. Still, it can be had at a price that makes its purchase an *immediate* economy.

The complete information that influenced many manufacturers to test the Exide-Ironclad Battery is yours for the asking. Before you buy another battery, get in touch with us. Get the latest data on battery performance and battery cost in electric industrial trucks and tractors.

Near you is one of our representatives. You will incur no obligation by dropping us a line asking for the information he can give you; but when you do feel the strong obligation, to yourself and to your business, to make sure that your electric industrial trucks and tractors are doing the most work at the least cost, let us show you how and why the reputation of being the most effective and economical storage battery for use in electric industrial trucks and tractors has been earned by the Exide-Ironclad Battery.



A list of prominent manufacturers who are using Exide-Ironclad Batteries in their electric industrial trucks and tractors:

Fisher Body Company, Detroit, Mich.
Dodge Bros., Detroit, Mich.
Cleveland Automatic Machine Co., Cleveland, O.
Buick Motor Company, Detroit, Mich.
Cadillac Motor Company, Detroit, Mich.
Delco-Light Company, Dayton, O.
National Cash Register, Dayton, O.
Crane Company, Chicago, Ill.
Eagle-Picher Lead Co., Joplin, Mo.
American Motor Body Co., Phil., Pa.
U. S. Playing Card Co., Cincinnati, O.
Remington Arms Co., Bridgeport, Conn.
J. G. Brill Company, Phil., Pa.
B. F. Goodrich Company, Akron, O.
Otis Steel Company, Cleveland, O.
Minnesota Steel Company, Duluth, Minn.

Exide
IRONCLAD
BATTERIES

THE ELECTRIC [illegible]AGE BATTERY COMPANY, Philadelphia
[illegible]*of Canada, Limited, 153 Dufferin Street, Toronto*

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

"Absorbo"

An illustrated folder describing "Absorbo," which are standard plates of natural cork, and which are used for deadening vibration of machinery, has been issued by the Cork Foundation Co., of 315 Fifth Ave., New York.

Diesel Engines

A bulletin, No. 1040, containing 32 pages, illustrates and describes modern methods in Diesel Engine building. This has been issued by Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago, Ill.

Pipe Threading Machinery

A 54-page catalog, No. 29, illustrating and describing Landis Pipe Threading and Cutting Machines, Pipe and Nipple Threading Machines and Chaser Grinders, has been issued by the Landis Machine Co., Inc., of Waynesboro, Pa.

Vacuum Recorder

Bulletin No. 140 describing the Uehling Type D Vacuum Recorder, has been issued by the Uehling Instrument Co., of Paterson, N. J.

Combination Floor and Rail Lift Trucks

for lifting and rolling loads of material piled upon wooden or metal platforms have been described in an illustrated bulletin issued by the Plimpton Lift Truck Corp., of Stamford, Conn.

Mill Saws

Catalog No. 10, containing 142 pages, which illustrate and describe the Ohlen-Bishop line of Saws, Files, Knives, etc., has recently been issued by the Ohlen-Bishop Co., of Columbus, Ohio.

Coal Dealers Machinery and Supplies

including wagon loaders, portable flight conveyors, portable belt conveyors, bagging machines, etc., are illustrated and described in Catalog No. 725, recently issued by the Gifford-Wood Co., Hudson, N. Y.

Static Condensers

of the Type LD for power factor correction on 60-cycle circuits are described in an illustrated folder, No. L 20044-B, issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. A booklet recently issued by this company is the Handbook for Fieldmen of the Petroleum Industry, which contains information of use in every-day working operations. This handbook is of pocket size, and is known as special publication No. 1731.

Electric Dumb Waiter

The Type F-18 Electric Dumb Waiter is illustrated and described in a bulletin issued by the Warner Elevator Mfg. Co., Cincinnati, Ohio. The Warner Dumb Waiter Winding Engine is also pictured in this bulletin.

Ash Hoists

An illustrated booklet, describing Morris Ash Hoists of the basement type, pitless type, sidewalk type, etc., has been issued by Herbert Morris, Inc., of Buffalo, N. Y.

Hoisting Machinery

Flory Hoists for construction and material handling operations are described in an illustrated catalog, No. 31, which has been issued by the S. Flory Mfg. Co., of Bangor, Penn. In addition this booklet contains descriptions of Electric Car Pullers, Derricks and Derrick Fittings, Machines for Car Haulage, etc.

Belt Conveyors

Catalog No. 409, containing 52 pages, illustrates and describes Jeffrey Belt Conveyors for almost every industry. Tables of dimensions are also included. This booklet has been issued by the Jeffrey Mfg. Co., of Columbus, Ohio.

Electric Hoists

An illustrated folder describing the Roeper Type "R" Electric Hoist has been issued by the Roeper Crane & Hoist Works, Inc., Reading, Pa.

Chucks

Catalog No. 520, containing 27 pages of illustrations and description of Westcott Chucks for Lathes and Drills, has been issued by the Westcott Chuck Co., Inc., Oneida, N. Y.

Soot Blowers

An illustrated bulletin, No. 220, describing the new Marion Soot Blowers, types E and EB, has been issued by the Marion Machine, Foundry and Supply Co., of Marion, Ind.

Jenkins Cracking Process

An illustrated bulletin, No. 101, describing the Jenkins Cracking Process, which is a standard unit for producing stable quality gasoline, has been issued by the Graver Corp., of East Chicago, Ind.

Portable and Stationary Elevators

Catalog No. 106, containing 40 pages of illustrations and description of Delta Portable and Stationary Elevators, has been issued by the New Jersey Foundry and Machine Co., 90 West St., New York.

Automatic Dial Scales

"Invisible Losses" is the title of an illustrated folder which has been issued by the Toledo Scale Co., Toledo, Ohio. This also illustrates several types of Toledo Scales for weighing, computing, counting, etc.

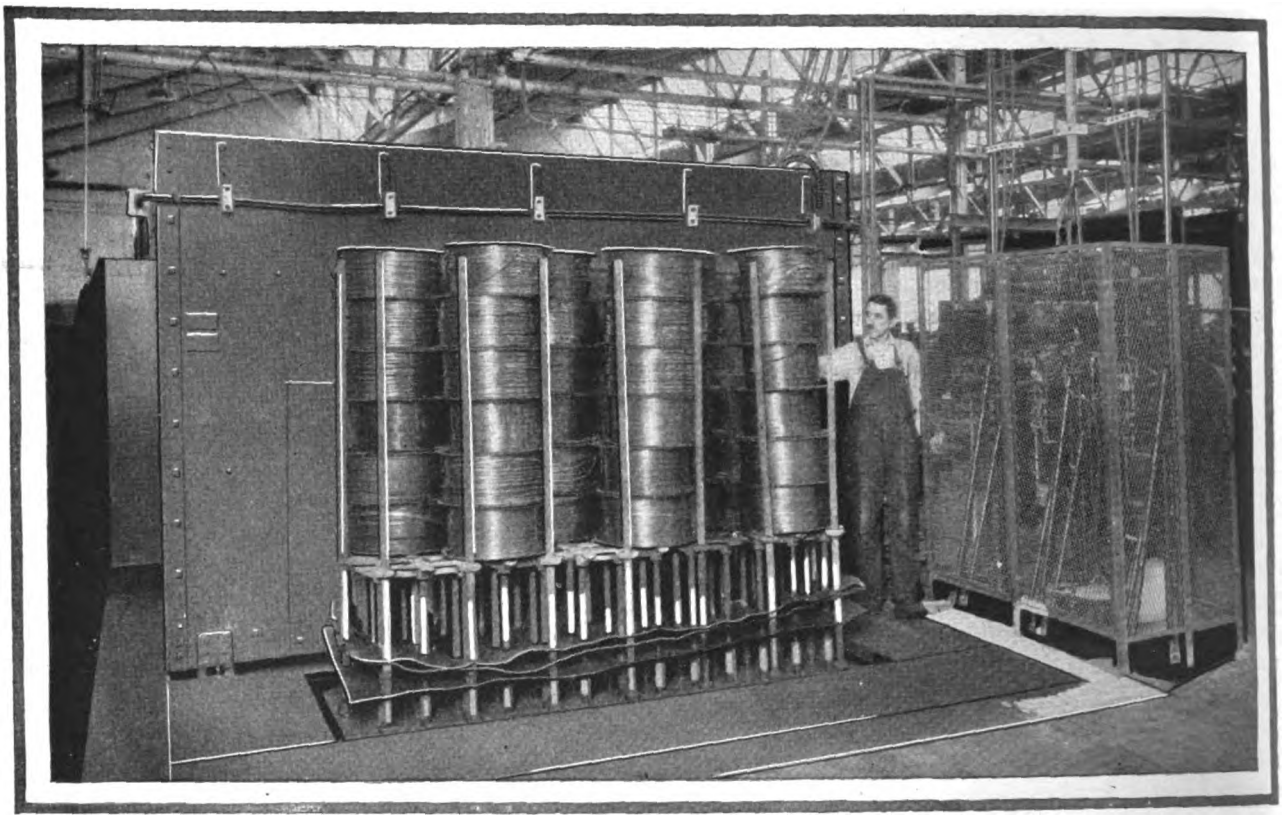
Air Heaters

The C-E Air Heater, which is a means of returning to the furnace a large proportion of the heat ordinarily lost in the flue gases, is described and illustrated in a 14-page booklet issued by the Combustion Engineering Corp., Broad St., New York.

Tanks for Oil Storage

are described and illustrated in a 20-page booklet which has been issued by the Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa. Additional literature issued describes and illustrates Elevated Steel Water Tanks for Municipal Service; Steel Tanks for Fire Protection for Industrial Plants and also for Water Storage, and still another booklet on Railway Water Service.

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Now All the Wire is Electrically Annealed

Maintenance engineers of an electric railway noticed a great difference in the ductility of a certain lot of copper wire. It was standing up longer under conditions of severe vibration. Inquiry brought out the fact that it had been electrically annealed. Now all the wire purchased is electrically annealed.

The quality of a copper-wire anneal depends upon an accurate and uniform temperature throughout the furnace chamber. Too much or too little heat causes the wire to crystallize and break under vibration.

This wire was bright-annealed in an electrically-heated water-sealed furnace. The heating units, mounted on the wall, radiate their heat directly to the charge. The accurate temperature control and uniform heat distribution, attainable only with the electric furnace, produce predetermined results which can be absolutely duplicated in every heat.

These outstanding features, alone, are causing the adoption of electric heat for numerous new applications daily.

In applications where quality of product is paramount, electric heat is meeting with special favor. The Industrial Heating Specialist located in your nearest G-E office can give you facts about various existing installations which will show you the possibilities of electric heat for your business.

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A Drawing-Room Economy Which Makes for Better Drawings

By Arthur L. Greene

ALL drafting room forces of industrial and engineering plants are familiar with the many difficulties experienced when drafting-boards become encumbered with thumb-tack holes. First and most obvious is the fact that the board must eventually be discarded; this represents a money loss of some value, particularly when large boards are employed. An even more serious disadvantage, perhaps, is the annoyance caused when the center-hole on a drawing is destroyed due to the occurrence of these thumb-tack holes under the drawing. Last of the difficulties to be mentioned is the fact that thumb-tacks in themselves do not hold the paper sufficiently rigid or taut on the board. In consequence when expansion and contraction take place over a period of time, the relative position of the paper on the board is apt to change. This in turn frequently results in an inaccurate drawing. The seriousness of such inaccuracies is easily appreciated when an assembly or scale drawing is being made.

In order to eradicate these difficulties, the Buffalo Bolt Co., of North Tonawanda, N. Y., recently conceived the idea of abandoning the use of thumb-tacks and using instead paster-strips of paper for fastening the drawing-paper to the board. In the accompanying illustration will be noted a drawing so fastened. The manner in which the adhesive strips are applied is readily seen. When small drawings are being made, for example, only the corners of the drawing-paper are fastened to the board. With the larger size assembly and scale drawings, however, where it is necessary that the greatest accuracy be maintained and where it is essential that no shrinkage or bulging of the paper occur during the process of drawing, the entire four edges and corners of the drawing-paper are fastened down on the board. This done, the drawing-paper is held rigid and taut and is thereby forced to expand and contract exactly with the motion of the board. The process of applying and removing the adhesive strips of paper is easily and quickly performed. In the former instance, the strips are simply moistened and applied. When the drawing has been completed, the paster-strips are again moistened and then pulled off.



Readable at 20 Feet—and Absolutely Dependable

You can correctly read the large, bold, black figures on a Motoco Dial Thermometer 20 feet away.

And when you read a Motoco you are sure it's telling the *truth.* It registers with *absolute dependability* any temperature between minus 40° and plus 750° F.

The Motoco is unfailingly accurate year in and year out because there is nothing to give out or wear out of adjustment. There is only *one* moving part in the

MOTOCO INDUSTRIAL THERMOMETER

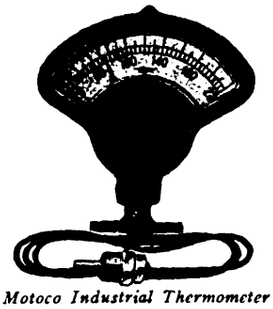
No gears, screws, levers, hair springs and other delicate parts in the movement. It is the *only* instrument made that way.

Friction and vibration soon wear away cams, levers, etc. Even 1/1000 of an inch wear on such small parts will seriously affect the accuracy of the reading.

With these big advantages, the Motoco sells for far less than other dial thermometers—in fact, it costs about the same as hard-to-read glass-tube thermometers of the better grade. Furnished with rigid stem or capillary tubing.

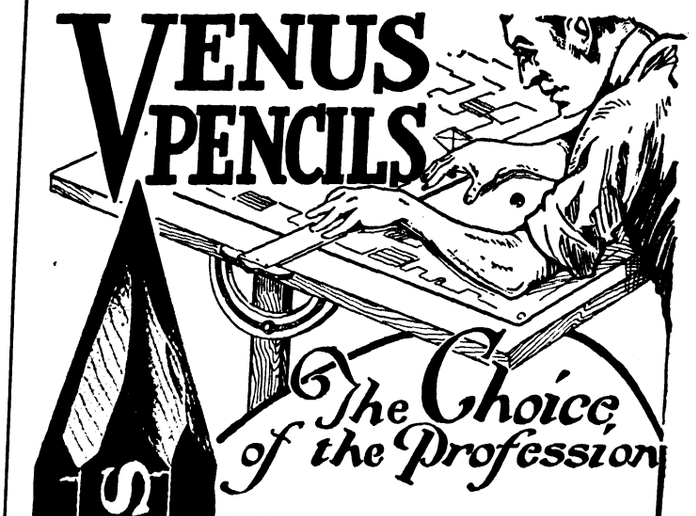
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Industrial Thermometer Division
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Made by the manufacturers of the famous Boyce Moto Meter



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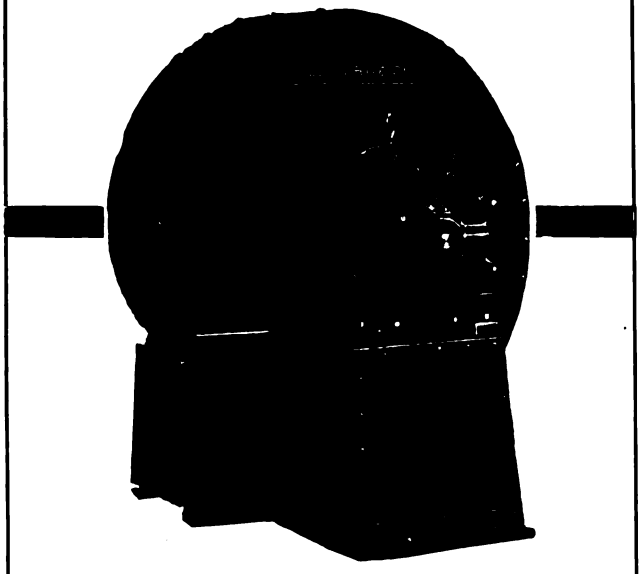
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Don't let your fans eat up horse power

When you're looking around for ways to cut down your power consumption, don't overlook your exhaust fans.

Sometimes a single exhauster will be using ten horsepower more than is needed to handle the job—sometimes twenty—sometimes fifty. Recently Buffalo fans were installed in a redesigned exhaust system, which showed a total power saving of 100 horsepower!



Buffalo Slow Speed Mill Exhausters are the best for your plant because:

1. They exhaust ALL the waste material, making it possible for you to reclaim some of it.
2. They are the only true slow-speed fans made.
3. Our Slow-Speed fan has a different wheel and housing than the standard exhauster—more efficient and of heavier construction.
4. Slow speed and larger dimensions reduce the maintenance costs.
5. Saving in horsepower alone (sometimes as high as 50% saving over other fans) often pays the cost of the fan.
6. You can get one of these fans of a size you need:—for belt or motor drive.

Write us for prices on these fans.

Buffalo Forge Company
440 Broadway Buffalo, N. Y.

"Buffalo" Slow Speed Mill Exhausters

SHEET METAL PARTS
now made on a
BIGGER FORMING PRESS

We have installed a powerful press to take care of jobs made from sheet metal. This press has a seven inch stroke, 16 inch die space, bed plate 42" x 72" and a 300 ton ram pressure capable of handling ¼" gauge and lighter on all classes of sheet metal.



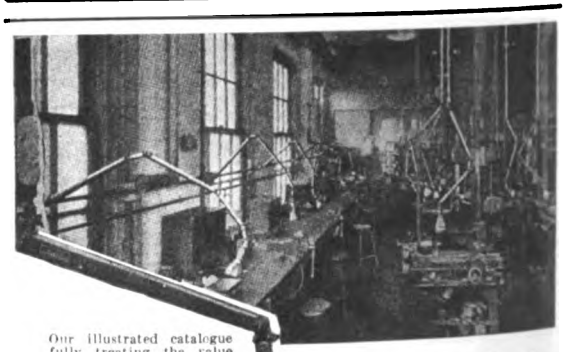
Sheet metal parts in many instances are displacing cast iron parts. They give a smoother result, are lighter in weight and easy to fit.

Steel, Iron, Brass, Copper, Monel Metal, etc. Stamping, Forming, Drawing, Blanking, Punching.

Send us pencil sketches of anything you have in mind. We will take up the problem and promptly give you our decision.

See Data 1924-25 A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks, Sweets Engineering, and Thomas Catalogues.

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Increases Production 25% to 50%

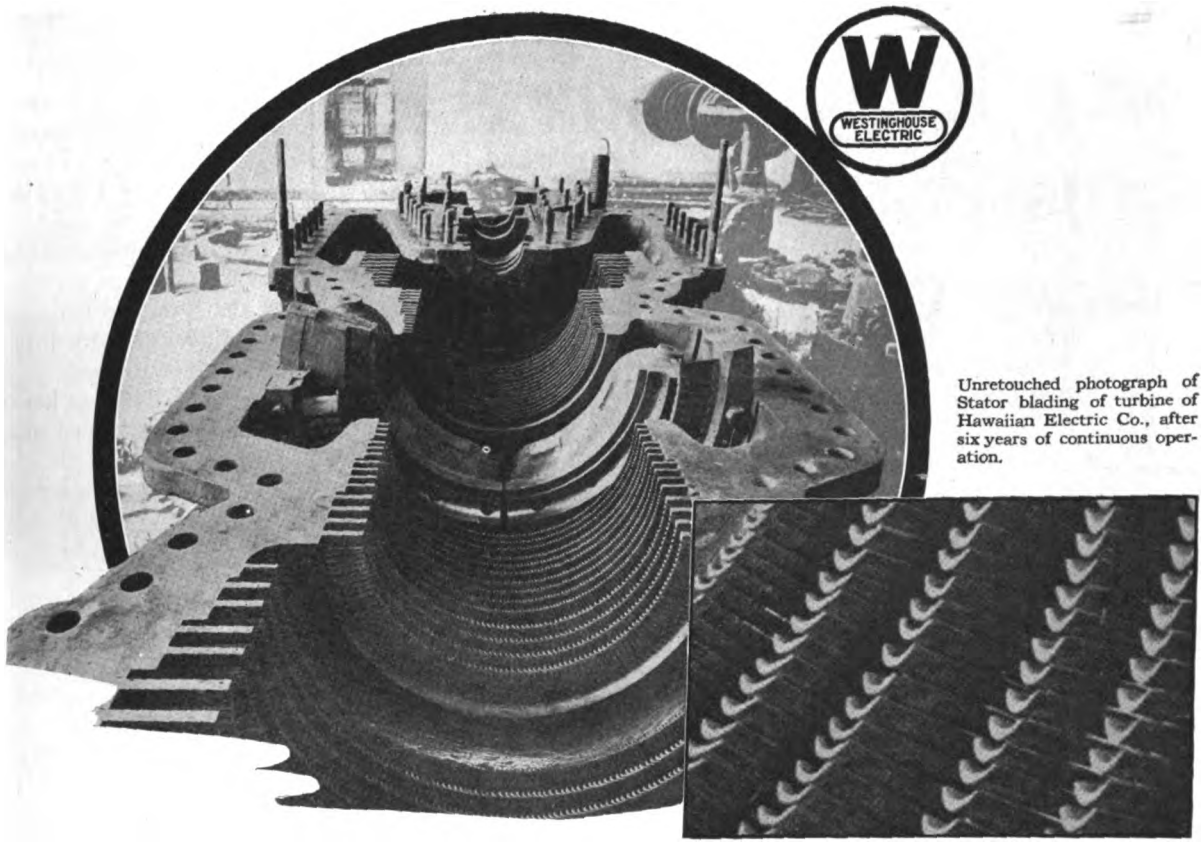
With American Fixtures each light is adjustable to the exact position the workmen require.

It saves eyesight, eliminates rejections and spoilage and increases production 25% to 50%.

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MILWAUKEE WISCONSIN



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Unretouched photograph of Stator blading of turbine of Hawaiian Electric Co., after six years of continuous operation.

Take a Look After 52,000 Hours of Continuous Operation

You wouldn't believe from the blading that this turbine unit had run for six years—52,560 hours—with only 29 hours' outage. Yet read this letter written by the Hawaiian Electric Company, Honolulu, T. H., when the turbine was dismantled in order to remove it to a new power station:

"This machine was installed by the Hawaiian Electric Company in 1914, and there has never been one cent spent on the blading of this machine since its date of installation. It carried the entire load of the Hawaiian Electric Company's system for a number of years, and was in continuous service from July, 1914, to June, 1920, during which time the turbine was out of service only twenty-nine hours. This outage was not caused by any turbine trouble, but due to shutting down for either cleaning the condenser or trouble with condenser auxiliary equipment. It is also an interesting fact to note that the oiling system for this machine was never cleaned out during this long period of operation."

What more could be said for Westinghouse blading—or for Westinghouse turbines generally?

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY
EAST PITTSBURGH, PA.
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

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We Can Reduce Your Glove Cost Fully 50%

Manufacturers of Canvas and Leather-Palm Gloves and Mittens for every industrial purpose. Write for samples.

THE SPARTAN GLOVE CO.
Station 2-B Dayton, Ohio

LAY Metal Case BROOMS



Judge a broom not only by its appearance and the reputation of its manufacturers but by the work it will do, by how well it does it and by the length of time it remains efficient in active service.

Compare Lay Brooms with any and all other brooms. Actual tests in your own plant will prove their superiority. They are built *right,* with stapled metal case, metal reinforcing band, two sewings of heavy flax twine and extra broad flexible sweeping tip of selected fibre.

Write for illustrated price list

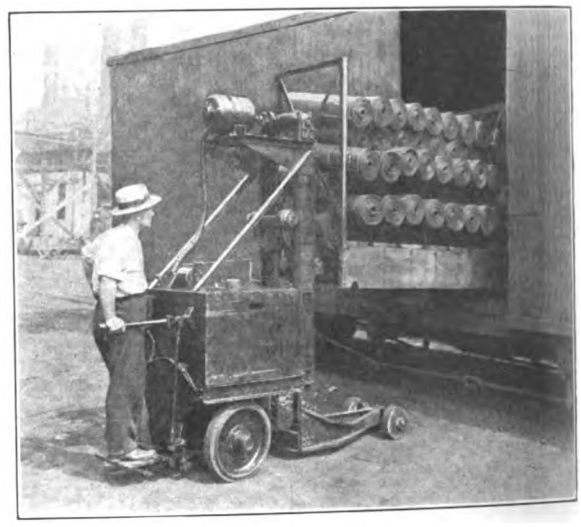
The JOSEPH LAY CO.
120 College Street
RIDGEVILLE, INDIANA
New York Office - - - - - - 110 W. 34th Street

Boosting Loads and Raising the Standard of Living

TEN years ago when wages were $1.50 a day for ten hours' work of common labor you did not see anything of this sort. Instead you would have seen six or eight low paid, poorly fed and miserably housed immigrant laborers tediously loading this car by hand. Not one of them would have under any circumstances lifted more than one roll of this heavy material at a time.

The electric elevating truck that you see here guided by one man who does no hard physical work lifts and pushes into the car sixty of these rolls at once.

This is the sort of mechanical evolution that has come to us during the past few years. It has helped to make



the American standard of living the best in the world because it lowers costs while raising wages.

In addition to its missionary work in these respects improved machinery of this and other kinds is rapidly doing away with hard, dirty and tedious work of industry, and multiplying the man power of our working population.

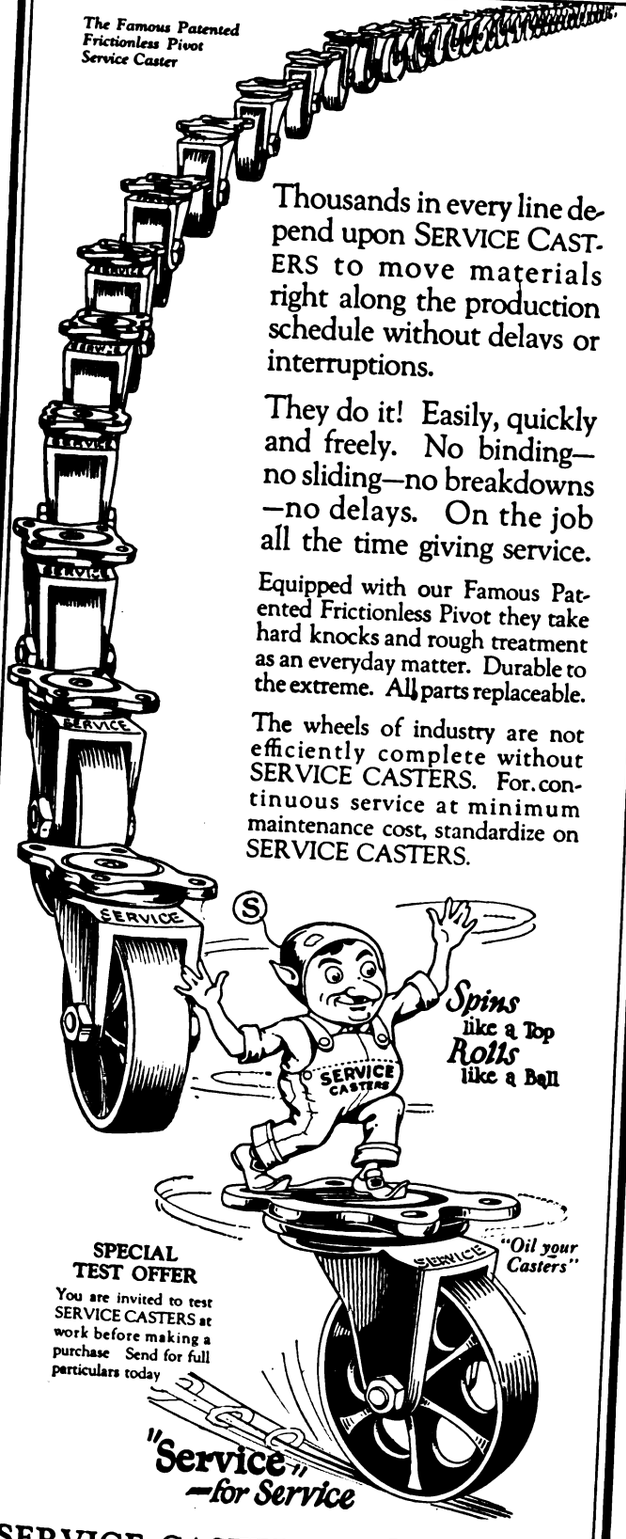
THE exceptional activity of the construction industry during the past four years has been a most important, if not a dominant, factor in shaping the course of general business. The building industry has been more than normally active because it has been engaged in making up the nation-wide shortage of building that accumulated during the war and the post-war years.

The resultant sustained demand for new building was probably the chief factor in bringing about the rapid recovery in general business that followed the great depression of 1921. Two years later in 1924 there was a mild depression of business and industry, which was probably prevented from developing into a serious depression by the sustained activity in building construction. At present we are having the greatest year that the industry has ever known, and there can be no doubt that this is contributing in a most important way to the generally prosperous times that are being enjoyed by most lines of industry, trade, and commerce.

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The Wheels of Industry

The Famous Patented Frictionless Pivot Service Caster


SERVICE
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The Guide Post of Industry

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A New Remarkable Book

that will show you how to cut to a minimum losses you now suffer from fire and accidents—

LANGE'S HANDBOOK *of* Safety and Accident Prevention

THROUGH a reading of this book you can in a large measure eliminate the tremendous waste that takes place in your factory every year through preventable accidents or preventable fires or both—a waste that necessarily eats greatly into any factory's profits. Fred G. Lange, for several years Assistant Director of Safety of the Youngstown Sheet & Tube Company and formerly Director of Safety for the Industrial Commission of Ohio, and a member of the National Safety Code Committee, has written this—the first complete presentation of the Safety First and Accident Prevention Movement. In a clear, concise, authoritative, and practical manner he describes every possible step you can take to bring down and keep down your accident and fire cost. This is easily one of the most important volumes INDUSTRIAL MANAGEMENT has ever published. Consider, if you will, the unquestionable fact that the prevention of just one accident or one fire will easily repay the cost of the book many times over. Then order your copy today and immediately make use of the far-reaching benefits it is bound to bring to your plant.

Needed by

Every **Engineer, Factory Manager, Superintendent, Foreman and Safety Committee-man.**

Every **Construction Superintendent and Foreman.**

Every **Personnel Executive and Welfare Officer.**

Every **Safety Engineer and Factory Inspector.**

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We are perfectly willing to let this book sell its own inestimable value to you. Read and examine it 10 days. If you are not firmly convinced that its worth is out of all proportion to its cost, return the book at our expense and you will owe us nothing. The demand for a complete work on this all-important problem of safety will assuredly be great and the first edition will soon be exhausted. By ordering now you will be sure of your copy. Price $5, postpaid. Write for special quantity prices.

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Please send me postpaid Lange's Handbook of Safety and Accident Prevention. I shall either return it to you within 10 days or remit the full price, $5.00.

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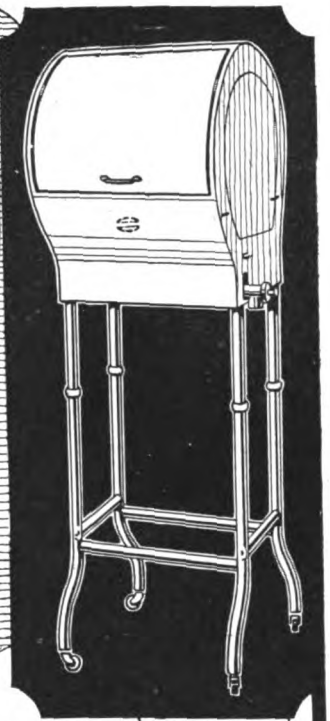
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The Hydro - Electric Dishwasher, made by the Hydro - Electric Mfg. Co., Milwaukee, Wis., has removed the drudgery of dishwashing from thousands of homes.



Hydro-Electric Mfg. Co.
Factory and General Offices
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Milwaukee, Wisconsin

Wisconsin Electric Co.,
Racine, Wis.

Gentlemen:

We have been using Dumore motors for over a year and find them adaptable to our purpose and rendering satisfactory service. We have tested out, during the last year, about ten other motors and are convinced that the Dumore is the best small universal motor on the market. We have not had one case of motor trouble for the last six months and we do not anticipate any.

Yours very truly,
HYDRO-ELECTRIC MFG. CO.
Carl J. Engelhard
Asst. Sec.



Type D
⅛ h.p. Cast iron frame. Enamel finish. Plain bearings, grease cups. Operates on A.C. or D.C.



No. 3GM—Stripped
⅛ h.p. Aluminum frame. Enamel finish. Norma bearings, ventilated. Operates on A.C. or D.C.



Type A—Stripped
⅛ h.p. Cast iron frame. Enamel finish. Babbitt bearings, wick oil feed. Operates on A.C. or D.C.



Type SAX
⅛ h.p. motor with special base. Nickel plated. Operates on A.C. or D.C.

DUMORE

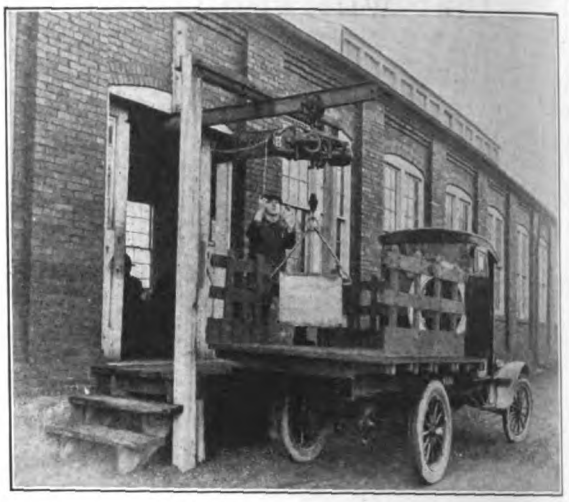
Fractional H.P. Motors

are giving trouble - proof service in thousands of places where a small motor must absolutely be depended on. Our engineering Department knows how to adapt small motors to hard jobs. If you are developing or improving a motor driven device, perhaps we can offer some suggestions that will help you. No obligation at all—just write or wire.

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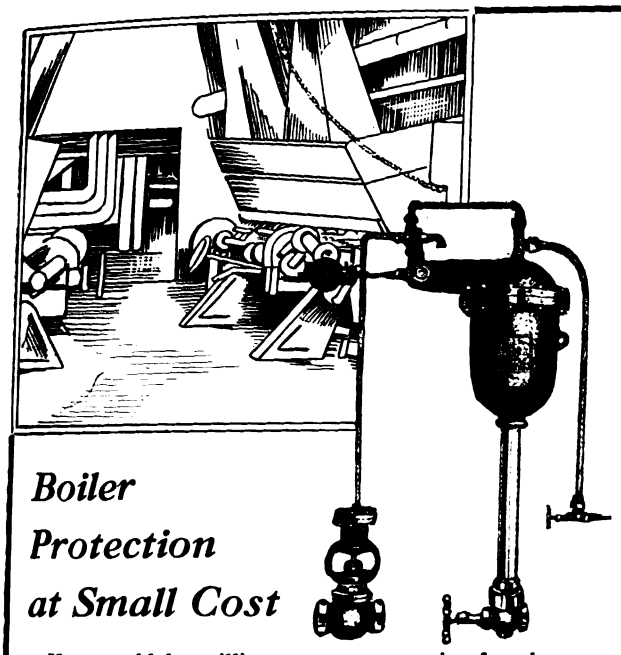
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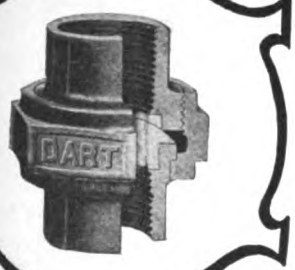
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Two bronze metal ball joint seats of the Dart Unions, properly ground together, assure a true ball joint, sealed, to prevent escaping steam.

Dart Unions are therefore guaranteed leak proof and mean added economy on your steam lines. They require no packing. Easily fitted. Dart Unions save power costs and coal bills.

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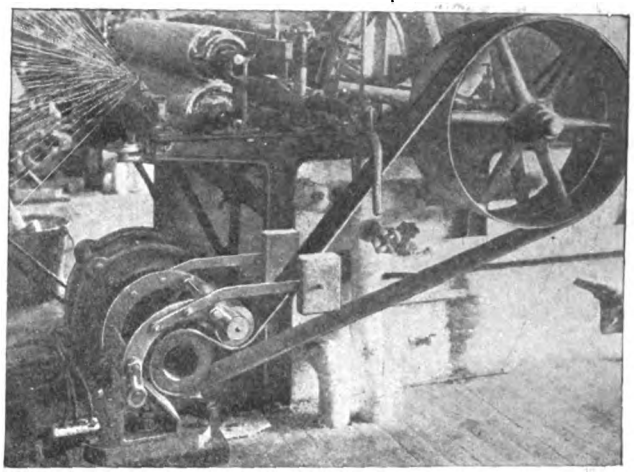
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DART UNIONS

THE LENIX DRIVE

(TRADE MARK REG.)



7½ H. P. Motor Driven Thread Dresser
Motor Pulley 5½" dia., 8" Face
Dresser Pulleys 21" dia., 4" face, Tight and Loose
Pulley Centers 3' 3"

The installation illustrated is one of *six* drives in the plant of one of the foremost shoe manufacturers.

The tight and loose pulley arrangement is successfully maintained in connection with the Lenix Drive. The soft elastic pull of the belt drive is combined with the modern requirements for economy of floor space, and the steady, gradual acceleration of the machine insures a uniform strength of the threads.

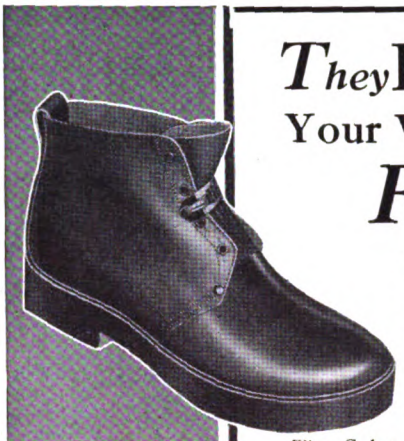
The Lenix is not an idler. It is a "belt wrapper" scientifically applied to belt drives for the purpose of eliminating belt slippage, saving floor space and increasing the general capacity of the drive.

Booklet *"Saving Slippage and Space"* tells more about the Lenix.

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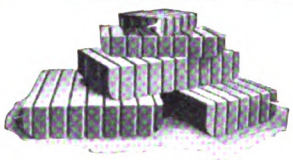

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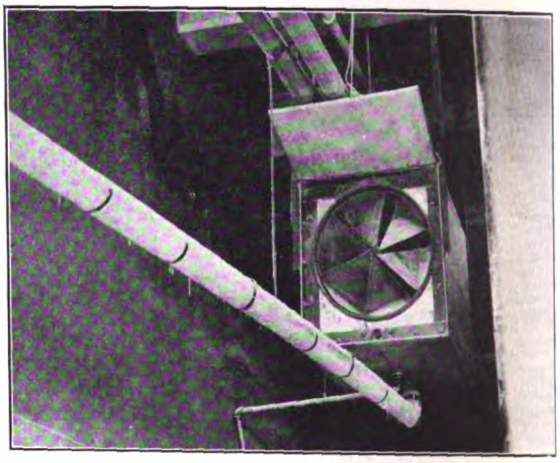
The POWELL PRESSED STEEL CO.
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An Improvised Humidifier That Works

By W. J. Risley, Jr.

THE illustration below shows a humidifying unit I have developed for our factory.

I used a 24" Ilg Electric Ventilating Co.'s motor-driven fan, 800 r.p.m., ball-bearing. The fan is boxed in with galvanized sheet-iron, leaving only the back end open.



Low pressure steam is admitted from our heating mains through the 1¼" covered line shown. On the inside of the box the line is divided and the steam is discharged *downward* each side of the box. Condensation drains away through the drain-line shown.

The unit consumes about 400 watts of current; maintenance is very low. One unit will humidify a volume of about 50,000 cubic feet.

ABOUT 30,000,000 miles have been flown in regular commercial air service throughout the world, according to a progress report of the survey now being made jointly by the U. S. Department of Commerce and the American Engineering Council.

This distance has been covered under widely varying conditions, over land and water, forests and mountains, by day and night, it was said by Prof. Joseph W. Roe, Director of the Field Staff of the Joint Committee on Civil Aviation, and head of the Department of Industrial Engineering in New York University, by whom the report was authorized.

"This accumulated experience," added Prof. Roe, "affords data for comparing the development and present status of civil aviation in this country and in Europe, as to growth and character of service, safety, reliability, financial aspects, government relations, etc.

"It also gives information on the conditions covering air transport, airways and the industrial use of airplanes as in agriculture, forestry, and surveying."

Prof. Roe favors a Federal air law providing for Government supervision of air transport, and indirect aid to commercial aviation, not necessarily in the form of subsidies.

"The Department of Commerce and the American Engineering Council are making a study of civil aviation and gathering data which will be of value as a basis for constructive legislation and for guiding investment in this field," his report continued.

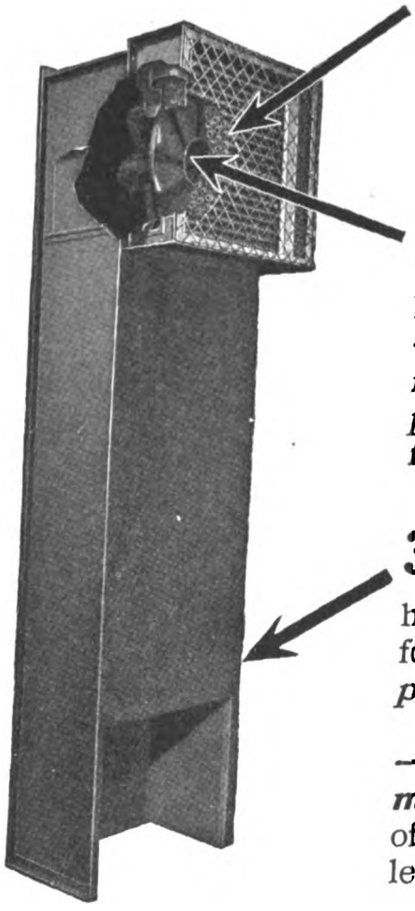
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2. A fully enclosed industrial type motor driven fan that forces the air through the heating coils and out into the area to be heated—therefore *easy control of heat, heat losses reduced to a minimum, hot and cold air pockets eliminated and heat more uniformly distributed.*

3. A recirculating box that carries air from the floor to the fan and coils where it is heated and forced back into the room—therefore *complete air circulation and even temperatures throughout large areas.*

—And the ***first costs, installation costs*** and ***maintenance costs*** of the Venturafin Method of Heating ***are lower*** than those of ordinary less efficient heating methods.

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 98.

A New Idea in Trucking Wheels for industry. See page 79. The Bassick Company. A booklet and a free sample of the new wheel is offered.

A Diagram Book Illustrating the Methods for Saving Space with the use of racks and lifters is offered by Economy Engineering Company. See page 64.

A Special Test Offer of Truck Casters can be obtained from the service Caster & Truck Company. See page 101.

The Details of Construction of the Yale Chain Block is described on page 46, by the Yale & Towne Mfg. Company.

Another Application of Electric Heat is shown on page 96, by the General Electric Company.

A Condensed Handy Catalog and Price List showing the complete line of Chucks and Arbors is now ready for mailing by The Jacobs Mfg. Co. See page 78.

A Folder, "Choosing the Locomotive for the Industrial Plant," can be obtained from Davenport Locomotive Works. See page 52.

Prices and Details of the Ettco Keyless Drill Chuck can be seen on page 71. Eastern Tube and Tool Company, Inc.

End Grain Wood Wheels for Trucks used in industrial handling is described on page 61, by the Metzger Company, Inc.

Information on Motors Particularly Adapted to Materials Handling Equipment can be obtained from the Star Electric Motor Company, see page 70.

An Interesting Treatise on the History of Asphalt and also information on industrial protective coverings is being mailed by the American Asphalt Paint Company. See page 48.

Aiding Industrial Illumination by Means of Reelite is described on page 69. Appleton Electric Company offer an illustrated catalog.

The New 1925 Catalog containing 40 pages of interesting data on electric lift trucks and profusly illustrated is now ready for mailing by The Elwell-Parker Electric Co. See page 42.

"Quality Facts About Belting," is the name of a booklet on transmission belting issued by Chas. A. Schieren Company. See page 38.

A Paint Made Expressly for Galvanized Iron is described on page 3, by Goheen Corp.

The Advantages of Proper Electric Starters, Speed Regulators are described on page 54 by the Cutler-Hammer Manufacturing Co. A Consulting Service is offered to industrial executives.

The Latest Data on Battery Performance and Battery Cost in electric industrial trucks is given in the service rendered by the Electric Storage Battery Company. See page 94.

Complete Data on Compressed Air Hoists can be obtained from the Curtis Pneumatic Machinery Co. See page 119. Also information on air compressors.

Details on the Super-Hoist, an unusual chain hoist with many exclusive features, is shown on page 74. Wright Mfg. Co.

Complete Details and Prices of All Steel Fabricated Buildings can be obtained from Blaw-Knox Company. See page 58.

Blue Printing in Four Minutes is described by the Paragon Machine Company. See page 76.

An Improved Oven for Cores is featured by Young Brothers Company on page 34.

The World's Market Place for Industrial Equipment is a description given to the Dodge Service to Industry. See page 36. Dodge Manufacturing Corp.

The Aid Given to Manufacturers in the Use of Fractional H.P. Motors is described on page 104. Wisconsin Electric Co.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchclock Corp. See page 66.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move is offered by The American Kron Scale Co. See page 32.

Snap Shots of Sensible Savings. A booklet on the tier lift trucking principle. See page 62, The Lakewood Engineering Company.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 83.

Industrial Railway Equipment of every description is manufactured by Easton Car & Construction Co. Complete bulletin issued. Se page 78.

Bulletins Describing Locomotive Cranes in sizes from 10 to 50 ton capacities, suitable for handling heavy materials from pig iron and scrap to pulp wood and other products should prove of interest to every industrial executive. Can be had by writing The McMyler-Interstate Co. See page 110.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 105.

Bulletins Describing the Filtering of Air in Industrial Plants are offered by the Reed Air Filter Company, Inc. Page 60. The latest of these are entitled, "Clean Fuel Air for Oil Engines," and "Reduce the Cost of Free Air."

Insurance Against Damage to Electrical Equipment is described on page 80 by the Chicago Fuse Manufacturing Co.

High Speed Drills for high speed production. See page 112. The Cleveland Twist Drill Co.

Counting Machine Operations Automatically has been a decided aid in speeding up production. Durant Mfg. Co. offer a 30-day trial on their speedometer. See page 86.

Reducing Your Glove Costs 50%. See page 100. The Spartan Glove Co.

Hand Book of the U-Re-Lite, book on protection and safe operation of electrical equipment. See page 8. The Cutter Co.

Exhaust Fans that Save H. P. See page 98. Buffalo Forge Company.

"Elapsed Time Records," is a booklet containing interesting data on time keeping problems. Free on request. The Calculagraph Co. Page 101.

Regulation of Boiler Feed Water is described by the Chaplin-Fulton Manufacturing Co., page 105.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see page 59. Wisconsin Electric Co.

Roller Bearings on Equipment Used for Heavy Handling and its relation to efficient operation. See page 2 or 7. Hyatt Roller Bearing Co.

Coal Handling Economy, possible whether handling five or five hundred tons, is shown on page 26 by Gifford-Wood Company.

The Elimination of Production Losses through the use of precision ball bearings and roller bearings is part of the service rendered by the engineers of the Norma-Hoffman Bearings Corp. See page 70.

Bulletin IND Offers a Solution to the Storage Problem. See page 114. Revolvator Company.

Information on "Progressive Assembly," a rapid movement of materials in process of manufacture, is offered by the Chain Belt Company, see page 120.

Sample Band or Hack Saw Blades sent on request. See page 78. The Henry G. Thompson & Son Company.

A Booklet Entitled, "Saving Slippage and Space," contains facts on the use of short center drive. For a copy see page 105. F. L. Smidth & Co.

Illustrated Folder and Prices on steel platforms, boxes, etc., is described on page 106. The Powell Pressed Steel Co.

Handling-Cost Reducing Cranes are shown on page 66 by Northern Engineering Works.

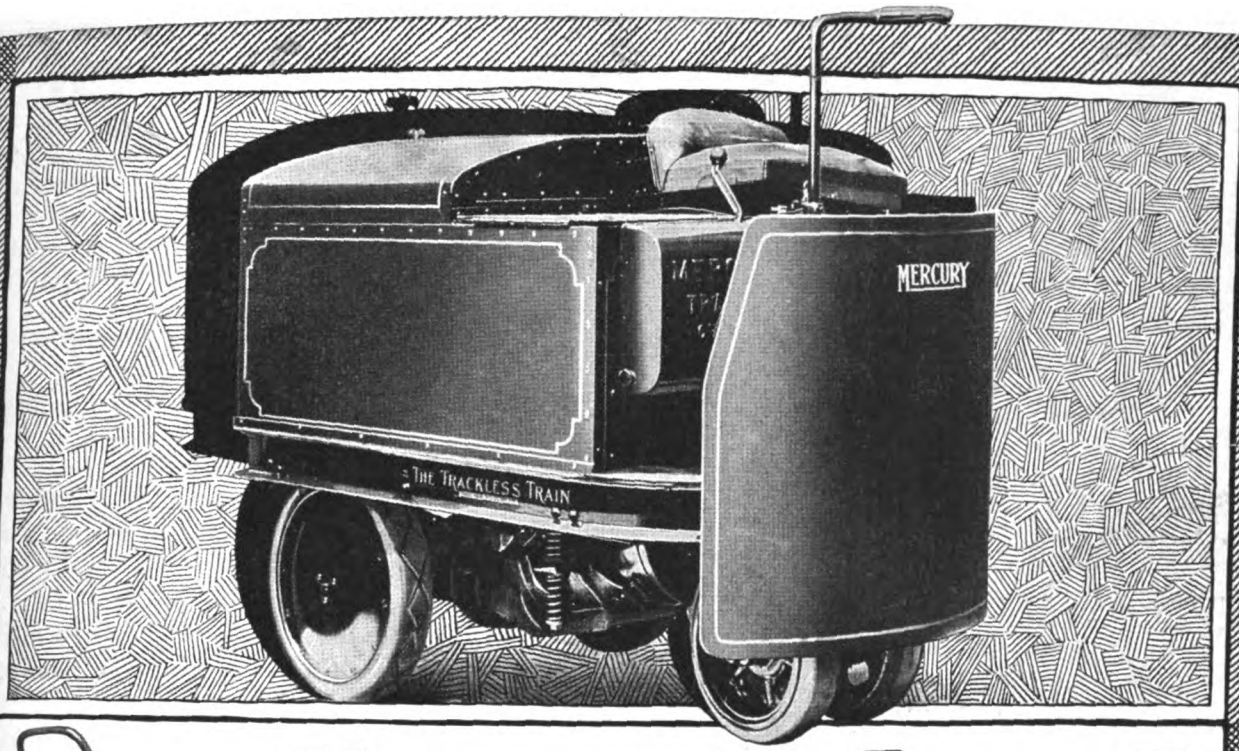
Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 114.

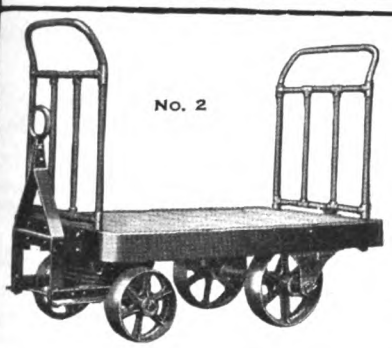
The Economical Utilization of Storage Space is the service offered by Durand Steel Locker Company. See page 47.

A Belt Lacer, extremely tough, durable, and plant is shown on pages 40-41, by the Clipper Belt Lacer Company.

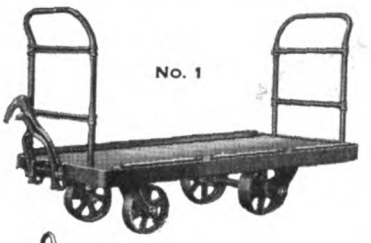
A New Alternating Current Motor with many features of approved electrical and mechanical construction has just

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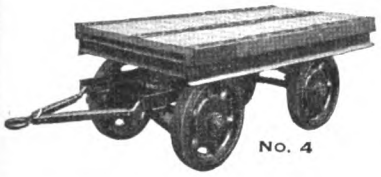




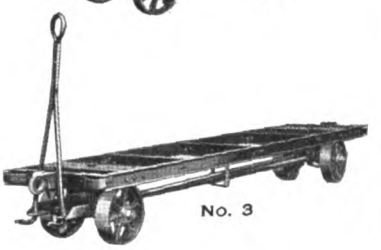
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Ask for tractor Bulletin 106.



No. 1—The all purpose castor type industrial trailer.
Request Bulletin A-100.



No. 2—This is a 4 ton capacity wagon-type steer.
Bulletin A-125 tells about it.



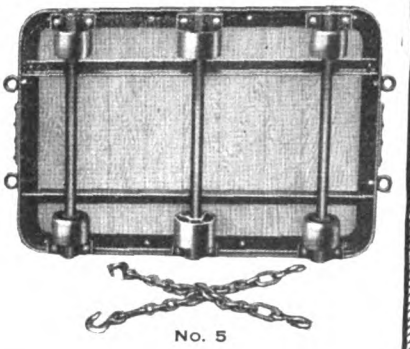
No. 3—A four-wheel steer trailer for long commodities.
Described by Bulletin A-120.



No. 4— Spring suspended — rubber tires — a minature highway trailer. *Complete specifications in Bulletin A-120.*

No. 5—A strong dolley for the hard-to-load shipments.
Ask for Bulletin A-120.

No. 6—Dump body trailer for bulk material. *For description request Bulletin A-120.*



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No. 4

—For handling pig iron or scrap with an electric magnet.
—For handling coal, coke, or ashes with a clamshell bucket.
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—For loading and unloading freight cars.
—For switching cars.
—And for any sort of industrial service requiring a powerful, flexible and easy handling 20-ton crane.

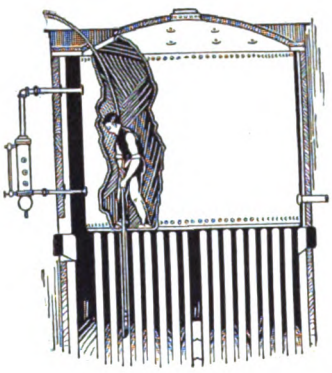
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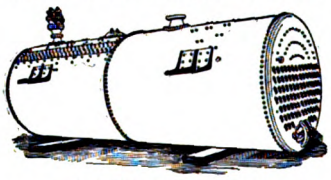
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been developed by the Diehl Manufacturing Company. See page 92.

"Mr. Barber's Scrap Book," contains information on the reduction of handling costs. See page 5. Barber-Greene Company.

A Free Sample of a Pencil with a choice of various leads, each adapted to a particular purpose, is offered by the American Lead Pencil Co. See page 97.

Efficiency Hand Book on Visible Index System is offered by the Globe-Wernicke Company on page 81.

An Interesting Booklet, "Safeguarding Industry's Greatest Asset: Man," explains an important means of accident prevention. See page 72. Industrial Gloves Corp.

The Solution to the Conveying, Elevating and Power Transmission Problems described in illustrated catalogs is offered by the Link-Belt Company. See page 77.

Complete Protection in Measurement Operations which avoid human errors is shown on page 50. Toledo Scale Company.

A Method of Operating Large Doors that Prevents Slamming, Jamming, Sagging and Dragging, is described on page 19. Richard-Wilcox Mfg. Co.

Pulleys and Hangers that stand up under the hardest transmission requirements. See page 74. American Pulley Co.

The Value of Good Lighting in Industry is shown on page 68 by the Industrial Lighting Committee of the National Electric Light Association.

A Metal Cased Broom specially made for heavy duty industrial use is manufactured by The Joseph Lay Co. See page 100.

Five Very Interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 110.

Jenkins Bros. Feature Their Line of Valves in use by many hotels, hospitals, industrial plants and public buildings everywhere. See page 92.

A Steam Trap on 30 Days' Free Trial. Also booklet R-268 which describes the new number 9 Sarco Steam Trap. See page 90. Sarco Company, Inc.

An Automatic Conveyor for Every Purpose. See page 55 Chicago Automatic Conveyor Co. An illustrated catalog can be obtained.

The Latest Addition to the Shepard Library, "Shepard Equipment for the Iron and Steel Industry," is now being mailed to interested executives. See Back Cover. Shepard Electric Crane & Hoist Co.

Keeping Dirt and Dust Out of Electrical Equipment is essential to efficient operation. A descriptive folder giving price list of portable electric blowers and testimonials by leading manufacturers is offered by Clements Mfg. Company. See page 66.

A Book on Bearing Metal Selection and other useful bearing information is now being mailed by the Magnolia Metal Co. See page 65. This book is the result of 38 years of bearing metal experience.

Conveying the Heavy Loads of Industry is part of the service Jeffery Engineers have rendered for the past 50 years. See page 30 for a list of the Jeffery Manufacturing Company products.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 98.

General Catalog No. 28 contains the complete line of power saving, transmission equipment, sold by the Pyott Foundry Co. See page 91.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co., page 2.

Foot Protection for Workmen, an aid to efficient production. See page 106. F. J. Stahmer Shoe Company.

A New Booklet on Blue Printing describes a machine that prints, washes and dries all in one operation. See page 28. The C. F. Pease Company.

A Contrasting Picture Showing the Use of Skybryte in an industrial plant is shown on page 44. The Skybryte Company. See free trial offer.

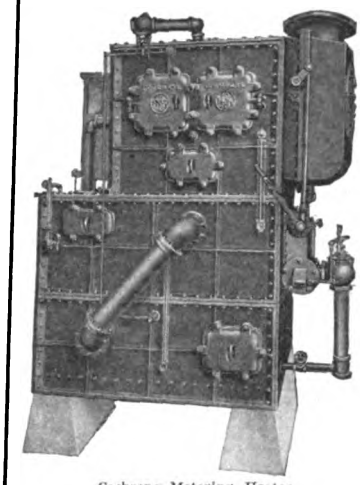
Bulletin No. 130 contains full information on shaft bearings. See 2 or 7. Hyatt Roller Bearing Company.

The Booklet, "Getting the Drop on Competition," contains some valuable information on saving time and increasing production. See page 6. McCaskey Register Co.

Booklets on Automatic Temperature Control of Heat in virtually every industry are offered by the Taylor Instrument Companies. Page 82.

Bulletins on Various Pneumatic Systems in Successful Use are offered by The Dust Recovery and Conveying Co. See page 20.

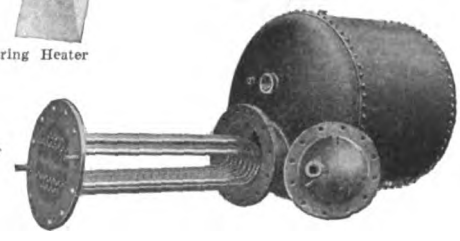
The Waste in Industry Through Dripping Oil from plain bearings is very interestingly described on page 4, by the



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Skayef Ball Bearing Company. Certified reports can be obtained on some of these investigations.

Illustrated Bulletin No. 29 shows a complete description of the Jennings Pump, its design, construction and method of operation. Page 10. The Nash Engineering Co.

Catalog on Metal Buildings. See page 9, Maryland Metal Building Co.

Louden Overhead Book pictures many overhead conveying installations in various industries. Can be obtained from The Louden Machinery Co. See page 73.

The Special Features of the Hack Saw Blade is described on page 86, by Victor Saw Works, Inc. Sample blades offered free.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 104.

Catalog No. 8 Describes an Indicating Thermometer useful for various industrial purposes and sold at an exceedingly low price. See page 97. The Motometer Co., Inc.

The Five Points of the Superior Construction of the Parker Vise is shown on page 91, by the Charles Parker Company. The small model useful for desk or files is offered.

Bulletin 38 describes the bearing assembly of the Century Type SC Motor, the motor especially adapted to materials handling machinery. See page 89. Century Electric Company.

Catalog on Equipment for Checking Time and Production. See page 76, Henry Kastens.

Drills, Cutters, Taps, Dies, and Reamers are described on page 67 by the Morse Twist Drill & Machine Co.

Catalog No. 30 Containing 205 pages of Practical Gear Data can be obtained from the W. A. Jones Foundry & Machine Co. See page 88.

Oil Burners as a Means to Economy on Various Industrial Applications is described in bulletin No. 112. See page 53. Hauck Mfg. Co.

Quantity Weighing with Speed and Accuracy. See page 85. Fairbanks Scales.

A 120-Page Catalog on the choice of adjustable Pipe Hangers. Grinnell Company. Page 24.

A Lift Truck for Free Trial in your own plant is offered by the Stuebing Truck Company. See page 113.

Coatings that Cut Down Upkeep on Rod, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 93.

Sanitation plus Good Appearance is the theme of Sanymetal Products Company advertisement, page 115. Bulletins offered.

The Advantages of Co-ordination of Parts, Motors and other Accessories for cranes is proven on page 87, Harnischfeger Corporation.

52,000 Hours of Continuous Operation is the performance on one Westinghouse Turbine described on page 99. Westinghouse Electric and Manufacturing Company.

Complete Data on the Venturafin Heating Methods can be obtained from American Blower Company. See page 107.

Bulletin 35 Describes a Clutch which is adaptable and standardized for many various machines. See page 75. Conway Clutch Company.

One of the Various Industrial Uses of Dow Conveyors is shown on page 1, by the Logan Co.

Information on Sanitary Drinking Fountains, together with prices and specifications, can be obtained from Rundle-Spence Manufacturing Company. See page 74.

Industrial Truck and Tractor Bulletin No. 26 contains some pertinent facts on industrial transportation. See page 84. The Baker R. & L. Company.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 84.

Seven Different Bulletins Are Offered by the Mercury Manufacturing Company. These describe various trailers and tractors they manufacture. See page 109.

Steel Boxes and Platforms as a part of a materials conveying system is illustrated and described in a catalog issued by the Truscon Steel Company. See coupon, page 3.

Eliminating Dust, Filings, Lint, etc., from Workrooms as a means towards industrial efficiency is described on page 117 by Invincible Vacuum Cleaner Manufacturing Company.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 114.

The New Heater Catalog "IL," describing feed water and surface heater as well as other heating units is now being offered by the Cochrane Corporation. For a copy see page 111.

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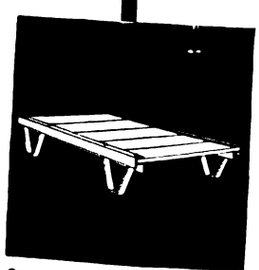


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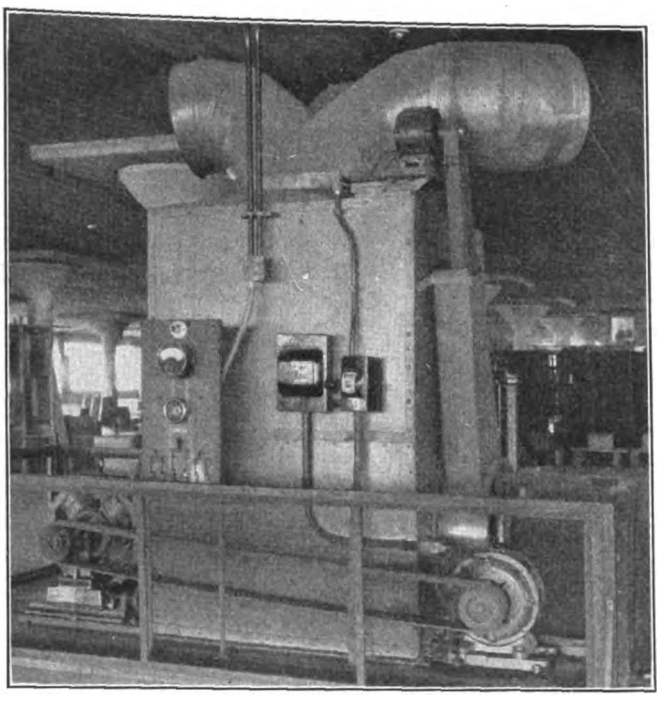
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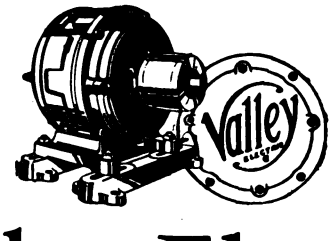
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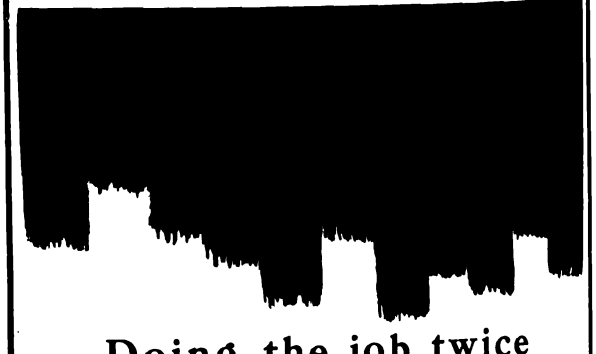
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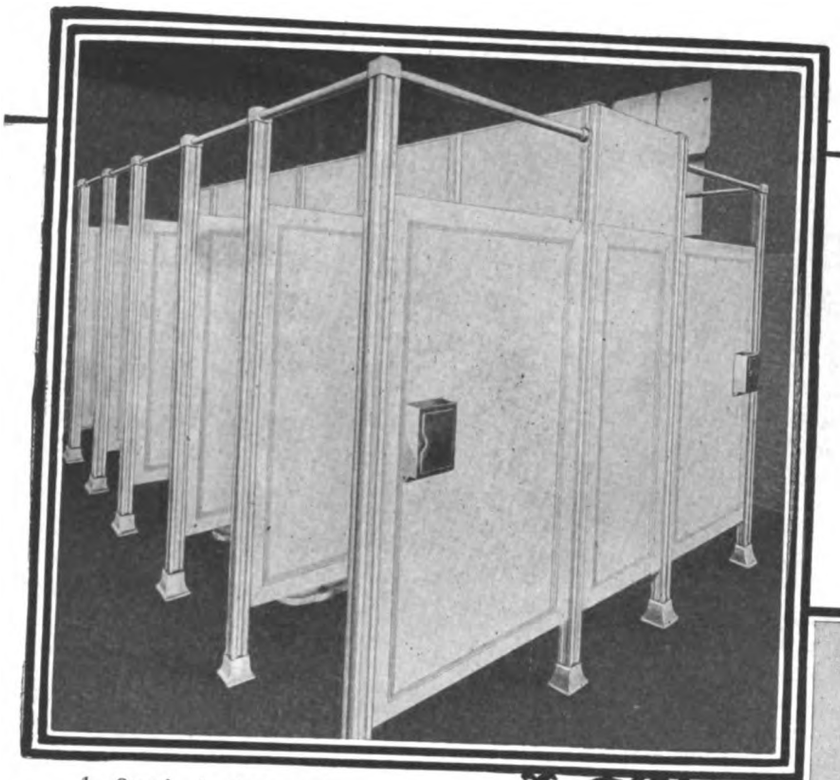
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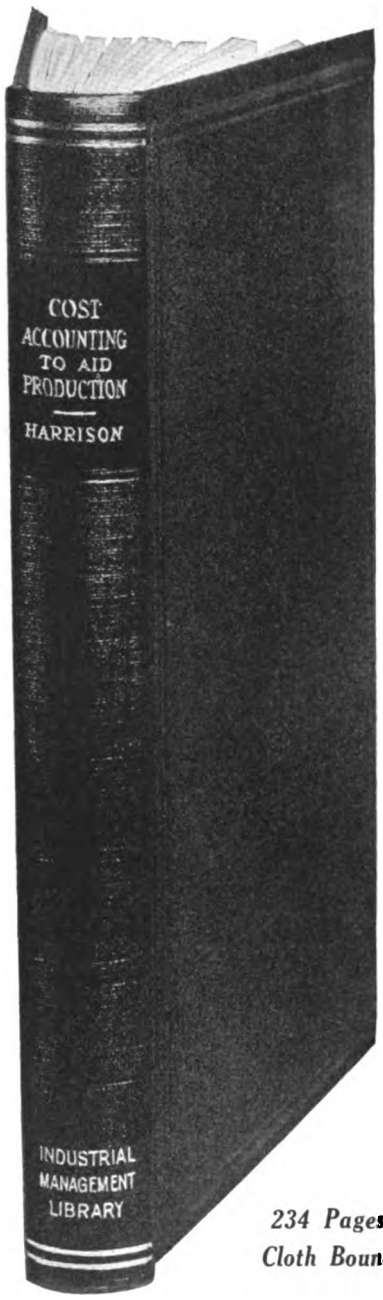
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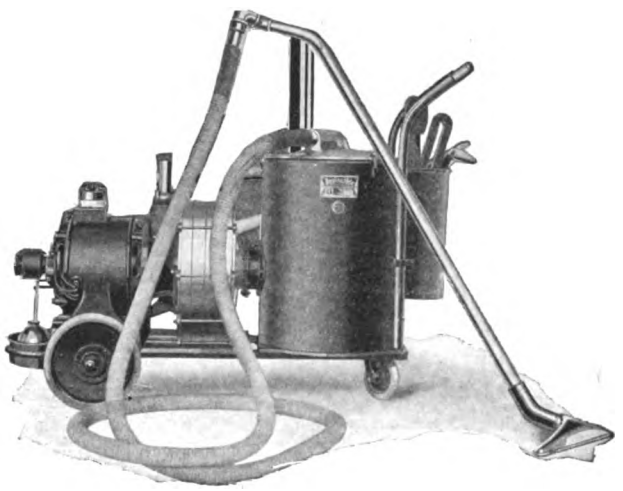
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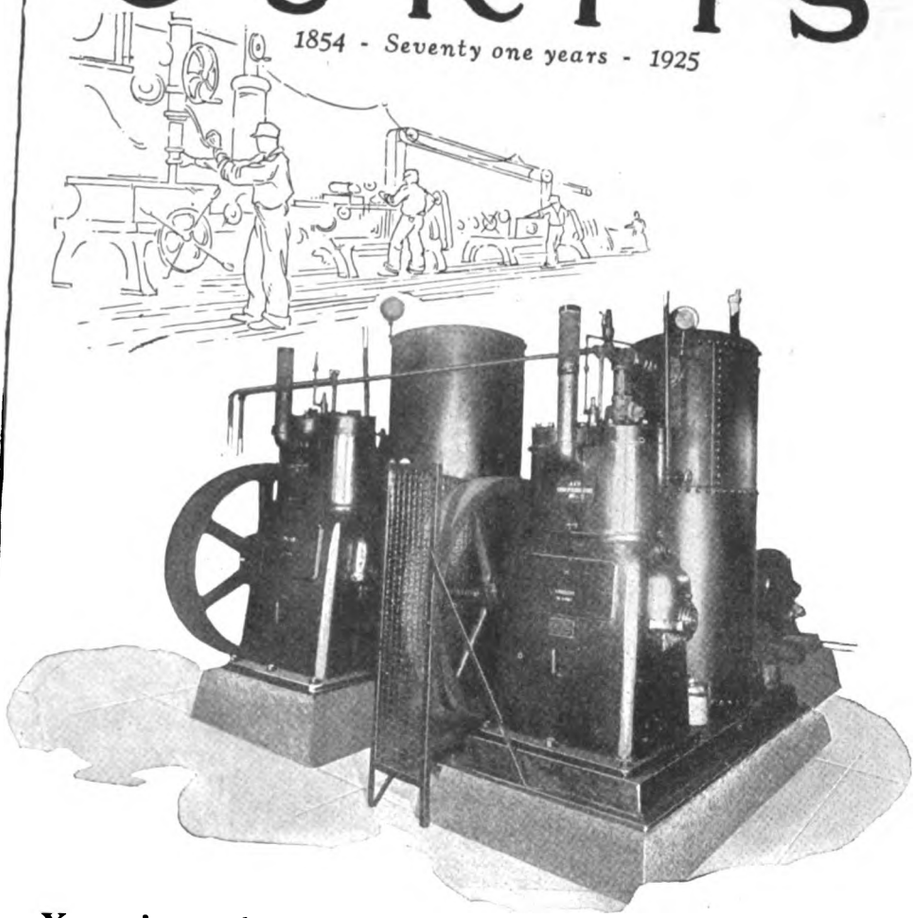
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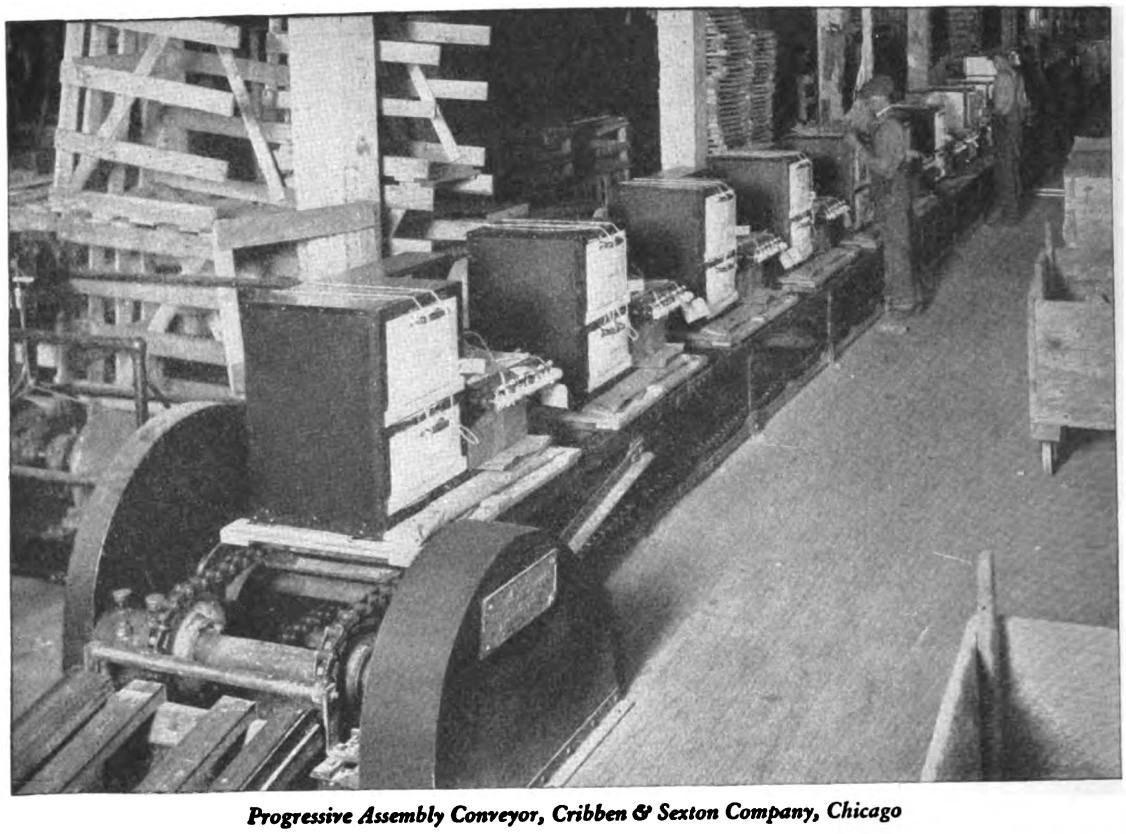
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A very successful application of progressive assembly manufacture on moving Rex Conveyors has been made in an entirely new field by the Cribben & Sexton Co. of Chicago, makers of the "Universal" Stoves and Furnaces.

The complete line of Cribben & Sexton Universal Ranges covers some seventy different sizes and styles. But by breaking up assembly operations into equally timed groups, practically all of the 70 types of gas ranges were adapted to conveyor assembly. With the exception of the skeleton frame and manifold assembly, all mounting operations are done on the Rex Conveyor.

By assembling gas ranges on the moving Rex Conveyor, this company not only made substantial reductions in direct labor cost 20% and in trucking cost nearly 50%, but also increased production from 80 to 200 ranges per day.

The photo above shows the foot end of the Conveyor delivering the stoves, ready for crating.

The Rex Conveyor is 196 feet long and carries the ranges 20 inches above the floor. It moves at the rate of 1 to 2 feet per minute, depending upon the output desired and the number of men working on the line.

Progressive Assembly is only in its infancy. It is applicable to many diverse units.

We will be glad to send information on this money-saving method to anyone interested.



REX CONVEYORS

CHAIN BELT COMPANY

711 Park Street Milwaukee, Wis.

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Milwaukee, Wisconsin
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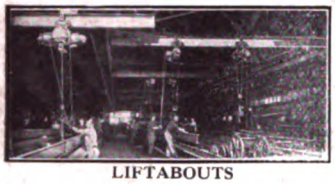
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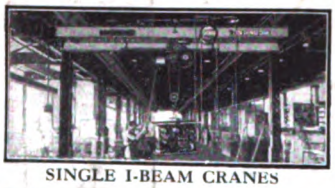
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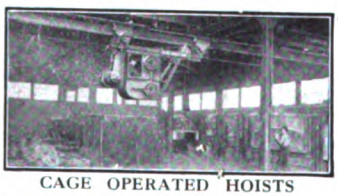
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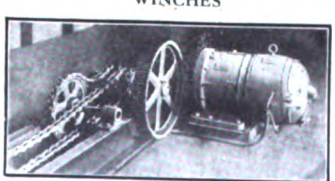
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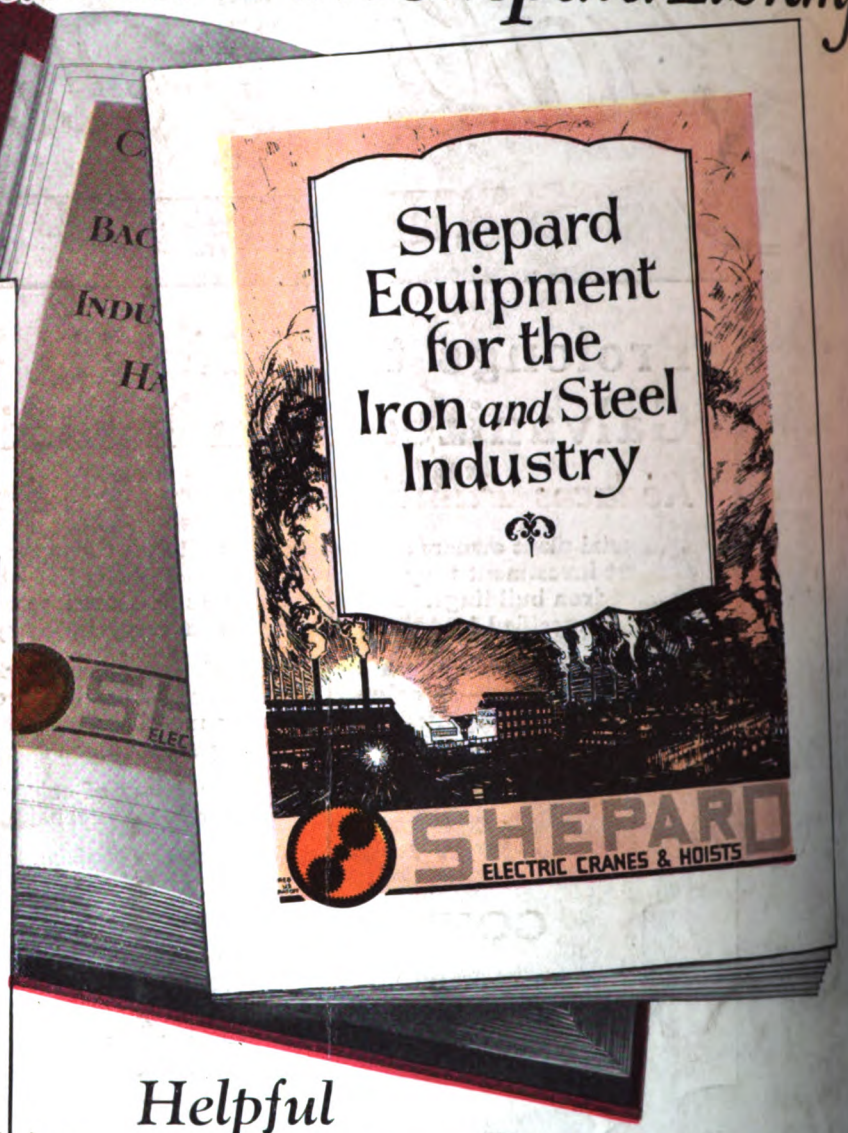
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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



How does Research concern the practical operating executive of the average industrial plant?

Read the leading article in this issue by Hugh G. Boutell, and learn of the important practical work being done by the Bureau of Standards—work of which you can avail yourself with real benefit.

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NOW *a Hyatt line shaft bearing that will fit your* NARROW *hangers*

THE new narrow center Hyatt line shaft bearing, the result of 35 years of manufacturing experience, is now ready for distribution.

This replacement box fits all standard makes of hanger frames.

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Ask your local mill supply dealer to show you the sample narrow center bearing and give you complete information about it.

This new, NARROW Hyatt bearing is available in the following sizes:

1 7/16" 1 15/16"
2 3/16" 2 7/16"
2 15/16"

Complete details on Hyatt line shaft bearings and a list of satisfied users are given in Bulletin No. 130. Write for your copy today.

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HYATT ROLLER BEARINGS FOR LINE SHAFTS

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BAKER'S COCONUT - another user



Upon arrival of the ship, a Dow Portable conveys bags of nuts to a vertical elevator on the side of a 10-story plant. Thence through practically every phase of manufacture, washing, paring, shredding, packing and shipping the finished product, Dow Conveyors expedite work and reduce costs of manufacture.

FRESH from tropic isles and sapphire seas! From the moment the swarthy coconut falls beneath the West Indian's huge machete, no time is lost in preparing Baker's Coconut, fresh and delectable, for the discriminating buyer. Immediately upon the arrival of the huge cargoes of "cocos" at Franklin Baker Company's own docks, Dow Conveyors commence their well-planned program of time, labor and money-saving work. Just one more illustration of how manufacturers, in many types of industry, are considering Dow Conveyors as essential to the highest degree of economy in the manufacture and distribution of their products. Ask our nearest office how Dow Conveyors can be profitably applied to *your* business.



Freshness is a prime requisite in the sale of any food product. In every box of Baker's Coconut (three kinds) you find the fine full flavor of the tropic nut still preserved—a condition made possible by time-saving methods in manufacture of which Dow Conveyors are essential factors.

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The Publisher's Column

In these busy days, you busy men of industry are besieged by countless demands upon your attention.

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All of these are proper and necessary parts of today's strenuous life, inside and outside of working hours.

But don't let them interfere with cultivating the most profitable habit that a man in industry can have—the habit of regularly examining your business industrial or trade paper.

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You will be interested in Truscon Alloy Steel Boxes and Platforms because we have designed them to simplify your material handling problems. This Truscon Box and Platform equipment meets the requirement of every kind of hand and mechanical conveyor. They outlast any other type—they do away with bins—save you money through additional space released for productive work—save you money in handling, too. Your raw material can be economically kept in Truscon Boxes from car to production line.

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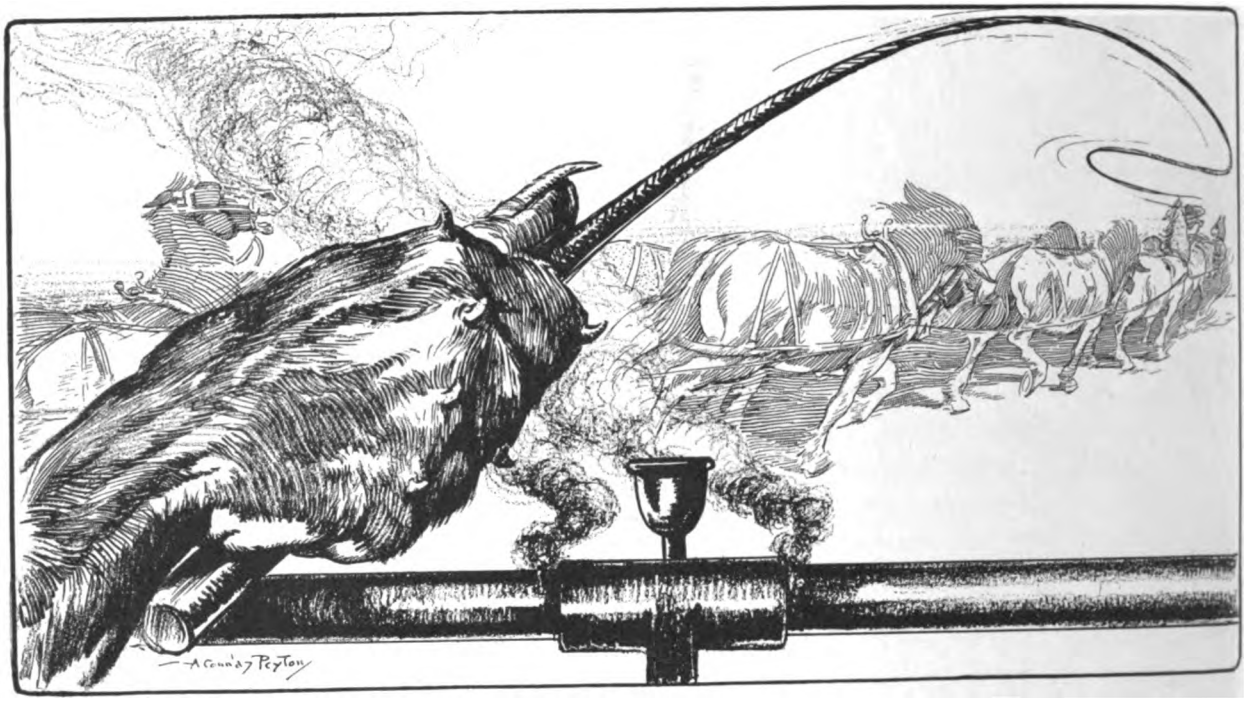
Special Box and Platform Representatives in New York, Philadelphia, Buffalo, Boston, Chicago, Pittsburgh, Cleveland, Detroit, St. Louis and Cincinnati.

Truscon Alloy Steel Boxes and Platforms are built in rib formation to secure great strength. The Platforms answer all lift truck requirements and the Boxes can be had fitted for crane handling and with corner reinforcing for high stacking range.

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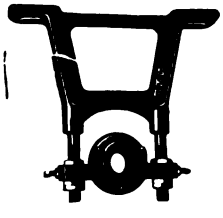
WHEN kilowatts vanish with alarming rapidity, when the steam gauge shows that horsepower is running away,—you can make up your mind that FRICTION, with a thieving hand, is throttling your plant efficiency.

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It would pay *you* to put your bearing problems up to SKF *now*.

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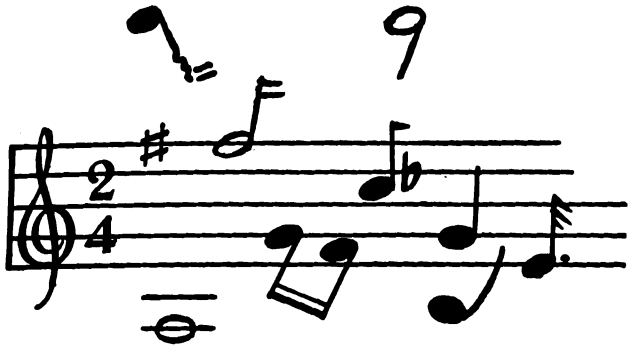
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SKF Puts the Right Bearing in the Right Place

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The Song the Directors Sang in 1925

AT their first quarterly meeting in 1925 a bunch of directors gathered around a big mahogany table and wrote a song. The tune was terrible and the words were worse. They ran like this:

"We've got to cut production costs
Oh, we've got to cut production costs
If we are to meet the high selling costs
of this competitive market."

The directors sang it to the fellows who got things done around the plant. They thought it was a rotten song too. But, they had to listen —for that was their business.

So they sharpened

their axes and set out. They did a neat trimming job—a man here, a man there—an operation here and an operation there.

But they couldn't quite stop the directors song.

One day one of them went out into the yard with his axe. But he was afraid to use it. To lop off any men from the unloading and handling gang would mean high demurrage charges.

That night

he went home and wept on his wife's shoulder —and then sat down to read his favorite trade paper. He chanced on an advertisement like this one. And he thought of those twelve fellows wheeling and shoveling in the yards of his plant —and he answered the advertisement.

Of course he received all the information he asked for. He owned a pencil and grammer school arithmetic was enough. It didn't take many minutes of figuring before he picked up his axe again.

Two men handle

all the car unloading, stock piling and yard work now. Ten men have been released for more productive jobs. And all that the yard has now that it didn't have before are three Barber-Greene "N" Portable Conveyors.

The directors have not had their song copyrighted—as a matter of fact they have thrown it into the fireplace. If you own a pencil and still remember grammar school arithmetic it might be worth while to write for our Mr. Barber's Scrapbook—especially if your directors have written a punk song.

This picture might well be titled, "A sad, sad, blow to yard gangs." Notice how the nose of the Barber-Greene Conveyor is pushed beneath the hopper-bottomed car to unload directly to stockpiles. That simply means goodbye to shovelers in the car, goodbye to wheelers to the pile and goodbye to high car unloading costs.
Our Mr. Barber's Scrapbook shows similar men and money saving coal and material handling layouts that are making good all over the country. A copy may be had for the asking.



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Coal Loaders . . . . . Automatic Ditch Diggers . . . . . Coal Feeders

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McCaskey in the Mason Tire & Rubber Co. Kent, Ohio

"THREE years ago," says D. D. Williams, Mgr. of Materials, Mason Tire and Rubber Co., Kent, Ohio, "we replaced our brass tool check system with a McCaskey register, keeping records on 500 tools and 1,000 workmen. The McCaskey carbon-backed slips show the workman's signature and number, date, tool number and quantity, size and description of tools taken. One writing makes three copies.

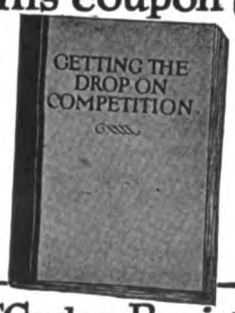
"This system eliminates the countless arguments that occurred under the brass check system. The decrease in loss of tools soon saves the cost of the McCaskey units.

"One feature which alone has paid for the McCaskey system is that with our brass check system the crib keeper, in checking out a man who was leaving, had to go over every check to get all the checks against that man. With the McCaskey a single reference shows what tools the man had out.

"The simplicity and general efficiency of the McCaskey Register saves us several hundred dollars a year."

What the McCaskey does for this company it is doing for many, many others, for the McCaskey Industrial Control method can be applied to any form of business. Write today for your free copy of the information-laden booklet, "Getting the Drop on Competition."

Mail this coupon today



The McCaskey Register Co.
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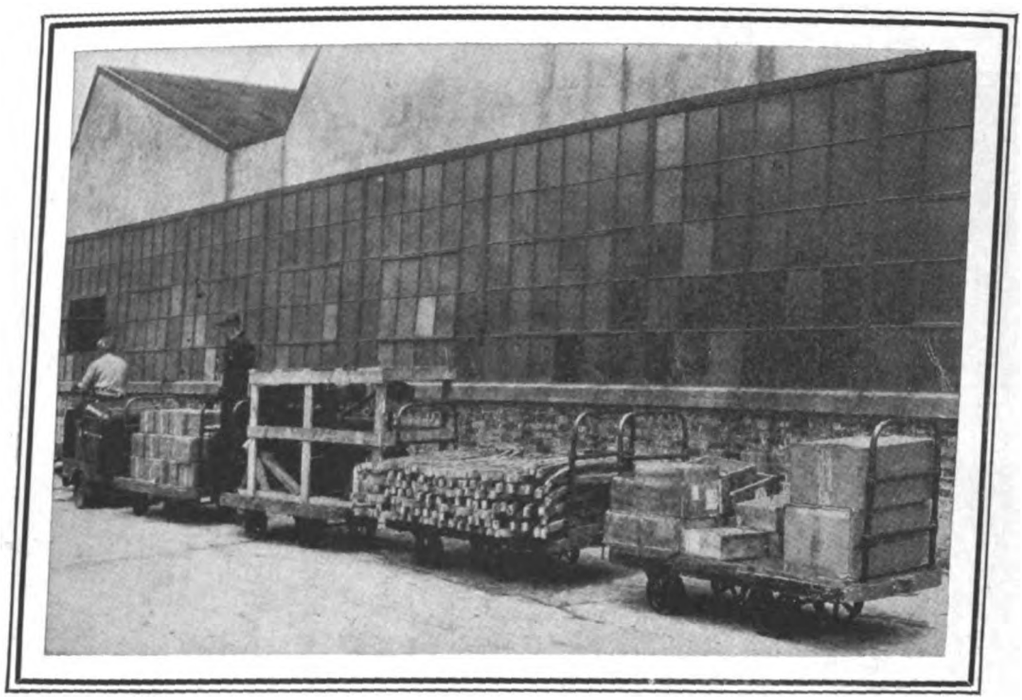
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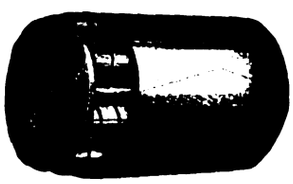
Bumping on and off elevators, jolting across uneven floors and platforms, these trailers roll along with unvarying ease and speed because Hyatt roller bearings are equal to the strain.

In both main and caster wheels they conquer friction and speed up the transportation of heavy materials.

The easy rolling motion reduces the pull on tractors. Bigger loads per trailer and more trailers at a time can be handled.

Except for a fresh supply of lubricant once or twice a year Hyatt bearings require no attention. The first installations made are today giving continuous, satisfactory service.

For prompt transfer of materials both indoors and out, insure efficient handling by specifying Hyatt roller bearing equipment.



HYATT ROLLER BEARING COMPANY

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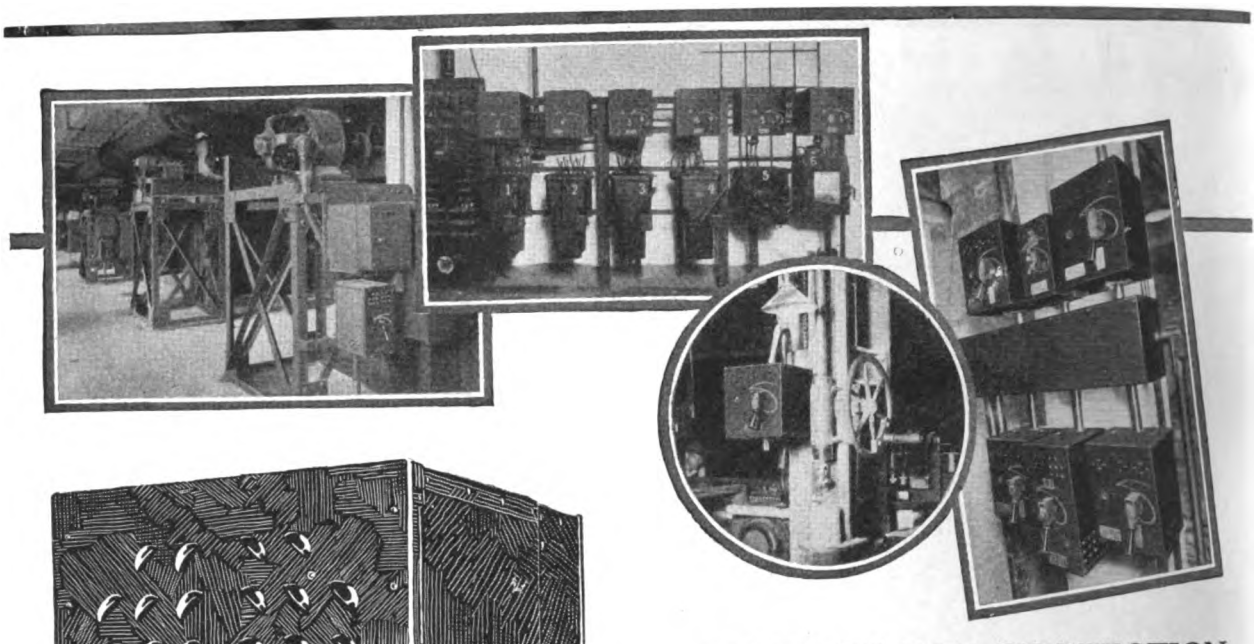
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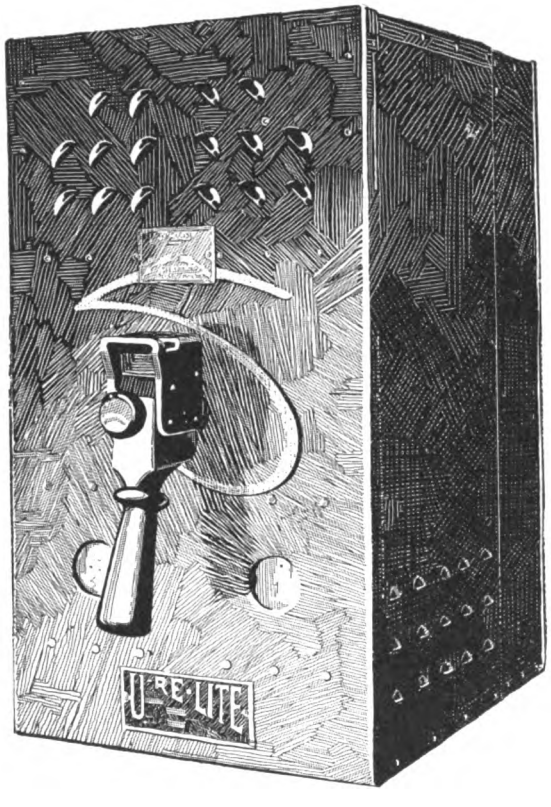
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It is fool-proof because it cannot be tampered with, once it is set and its protecting case is locked by the man in charge. You can't defeat its purpose by even *holding* the handle against an overload or short circuit. The switch members trip out just the same, and your valuable motors and other equipment are *permanently* safe. No fuses are necessary in the circuit.

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I-T-E

This is probably the best-known and most valuable trade-mark in the electrical field. I-T-E on Circuit Breakers spells "36 years of Cutter Dependability in Electrical Protection." It protects you against inferior circuit breakers in the same way as does "U-Re-Lite."

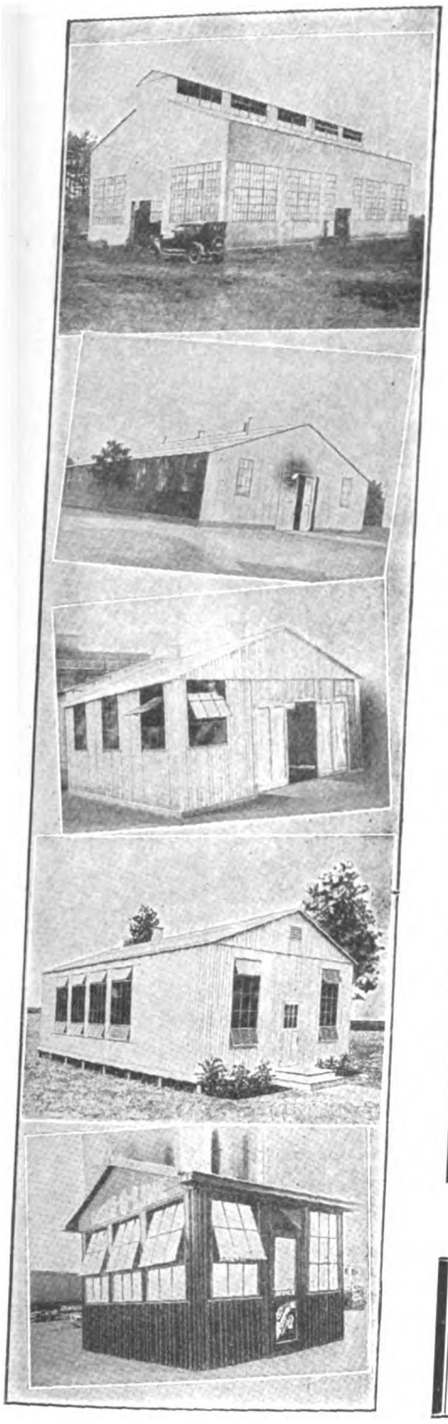
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A Maryland Metal Building is just as permanent as a building of brick or concrete—strong, durable and from every standpoint of utility just as efficient and satisfactory. The investment, however, represents a lower outlay than brick or concrete.

Do you need more space—storage or factory—or a special building for any purpose? The facts and figures regarding Maryland Metal Buildings are convincing.

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Lyonore Metal is a special, scientifically formulated alloy, that resists rust and corrosion. It outlasts any other galvanized metal on the market. It is one reason for the superiority of Maryland Metal Buildings. Mail the coupon today—there's no obligation.

I.I. 11-25

Maryland Metal Building Co.,
McComas and Race Streets,
Baltimore, Maryland

Please send us a copy of your catalog. We are interested in a building, size..... x.....to be used as..... What would such a building cost?

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MARYLAND METAL BUILDING COMPANY

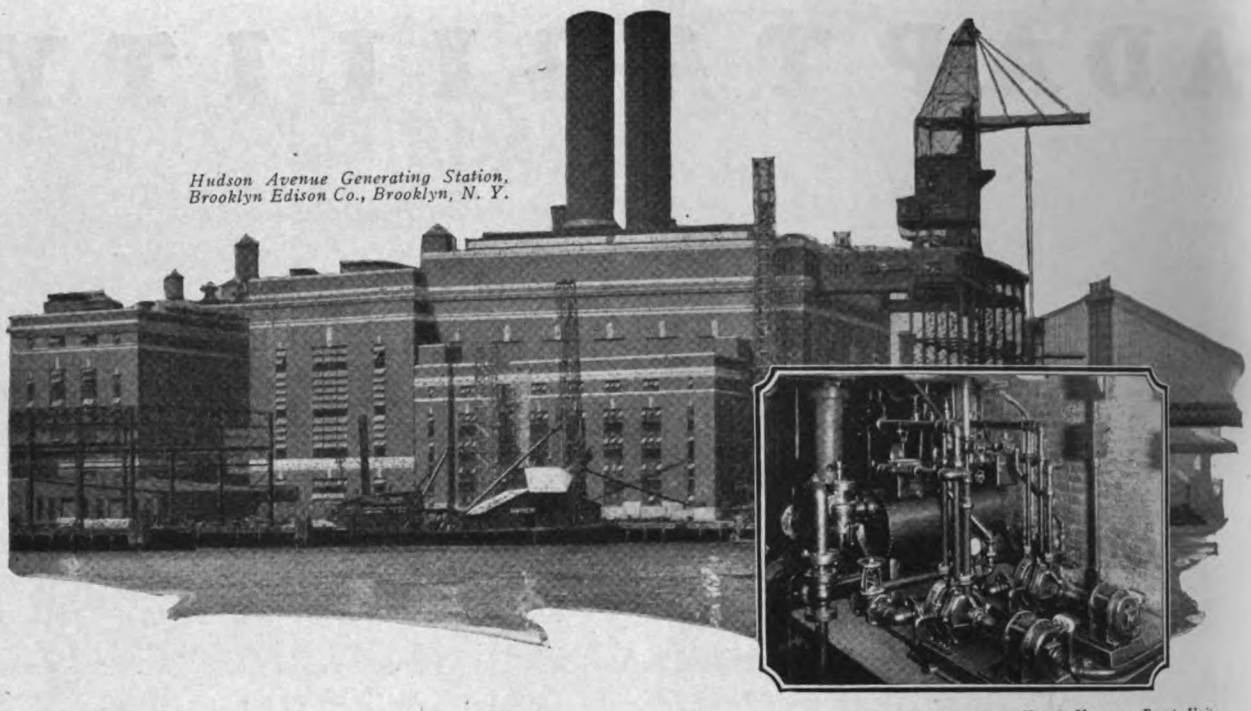
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One of the two motor-driven Jennings Hytor Vacuum Pump Units, Duplex Type B, installed on the return line heating system in the Hudson Avenue Station.

Hytors serve this 500,000 K. W. power station

In the Hudson Avenue Station of the Brooklyn Edison Company, a Jennings Hytor Type B Duplex Vacuum Pump Unit is relied on for removing the condensate and air from the return line vacuum heating system in the turbine room, boiler house, and service building. Condensate is discharged into one of the station's 45,000 gallon water storage tanks located in the boiler house basement.

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For this installation, as well as for all others where only the finest equipment is used, Jennings Hytors are a logical choice. They can always be counted on for unfailing performance year after year. Jennings Hytors are built to make good and they do.

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NOVEMBER, 1925

Industry Illustrated

The Plant Machinery and Equipment for Low-Cost Production Presented in Pictures

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THERE is one raw material that is used in the manufacture of every product. It is *power*. Its intelligent application has been the greatest single cause of our tremendous industrial expansion and prosperity.

December has come to be particularly a power month. Each year during the first week of December is held in New York an impressive exhibition of Power and Mechanical Engineering, which is a striking object lesson in progress for those who can attend.

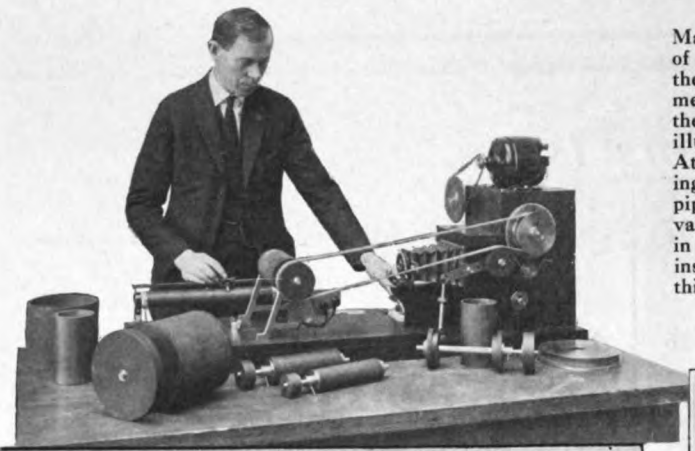
INDUSTRY ILLUSTRATED, next month, will parallel this exhibition, in pictures, for the benefit of those who cannot attend and as a guide and reminder for those who can.

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Uncle Sam—Practical Scientist

The Bureau of Standards, and Its Value to American Industry

By Hugh G. Boutell

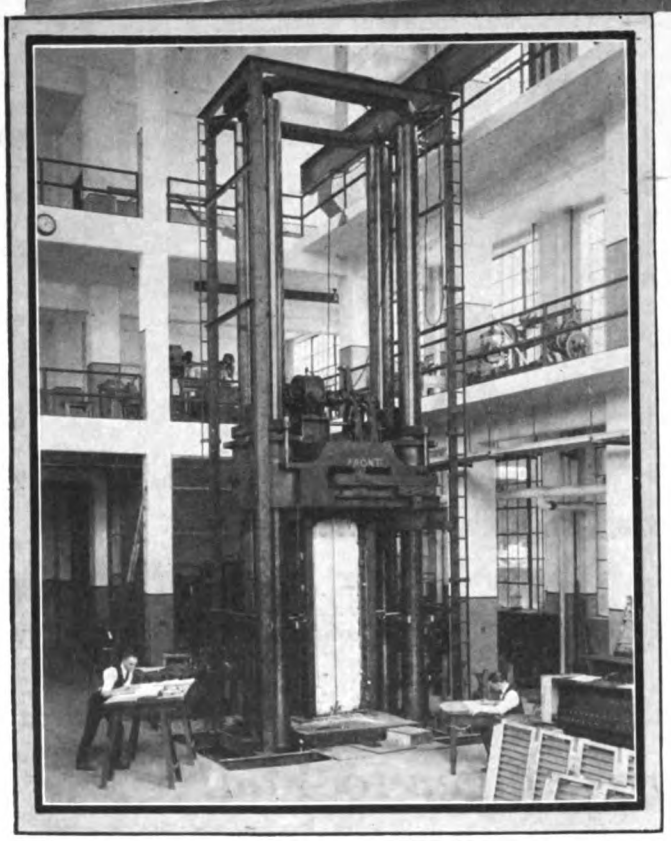


Many of us, misled by the name, think of the Bureau of Standards, at Washington, as a place where they keep the official standards of weight, linear measure, liquid measure, and so on. But that is only a small part of the business of this increasingly valuable Bureau, as the illustrations on these four pages show.

At the left, for example, is a machine for photographing in one strip the entire outside surface of a piece of pipe. The Bureau is studying the corrosive action of various soils on metal pipe. The specimens are buried in different localities throughout the country, and are inspected from time to time. Photographs made by this means show the development of corrosion on the pipe, and form a convenient permanent record.



The fundamental standard of mass of the United States. This shows the platinum-iridium kilogram furnished by the International Bureau in Paris, to which all weights in use in this country are indirectly referred. This standard is kept with the greatest care under a double bell jar in the vault at the Bureau of Standards. The working standards of the Bureau are compared with this National Standard.

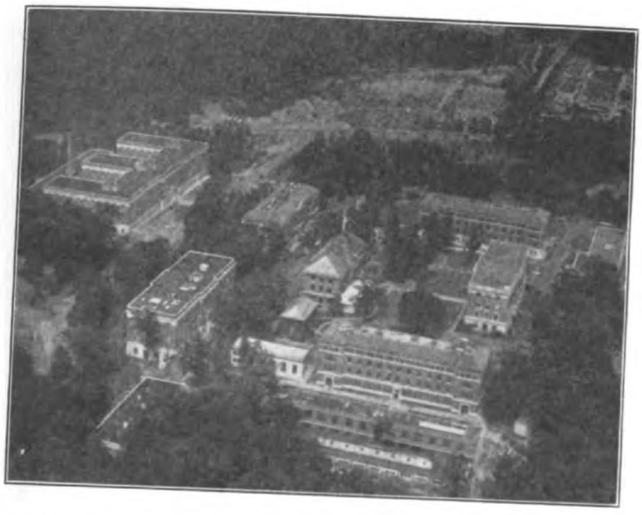


The largest testing machine in the world. This machine can exert a force of ten million pounds in compression, sufficient to crush full-sized columns, walls, and piers. In this picture a sample for the new Delaware River bridge is being tested. The machine is operated by hydraulic pressure, the cylinder being placed below the floor. The large screws are used to adjust the position of the upper head for specimens of different length.

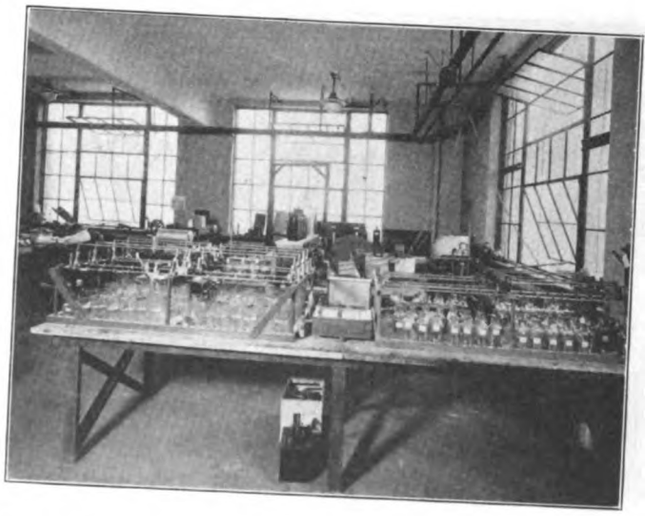
Specimens of optical glass made by the Bureau. Before the war not one pound of optical glass was made in this country. Now, largely owing to work of the Bureau of Standards, we can make as good glass as any produced in Europe. Each of the "melts" shown in this picture weighs about 1,000 pounds.



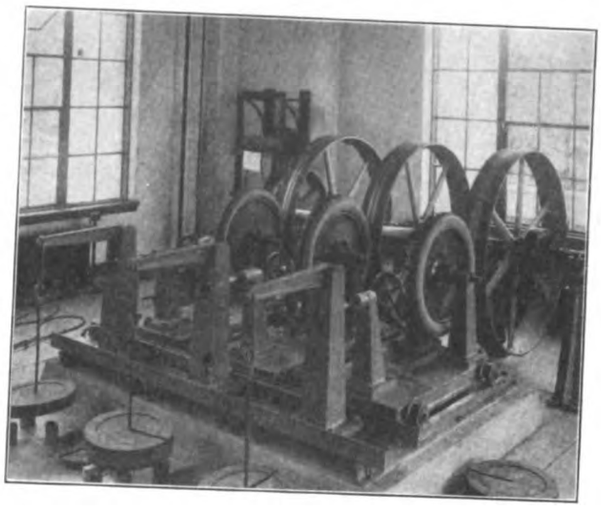
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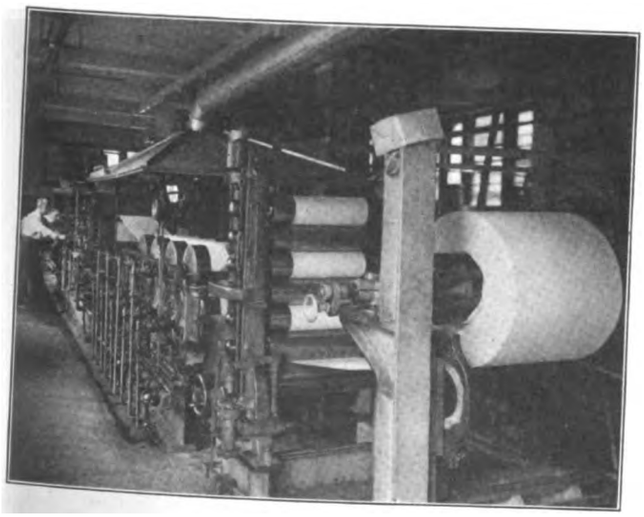
Aeroplane view of the Bureau of Standards. The Bureau is located on a tract in the Northwest section of Washington. Each building was specially designed for the work which it houses. There are eleven scientific and technical divisions, each of which deals with a broad field of work. These divisions are subdivided into sections, of which there are about 60 in all. The Bureau has, in common with most federal bureaus, suffered under a handicap, in that it could well use many times the appropriations available. Nevertheless, it has functioned with an ever increasing value to the industry and commerce of the nation.



Above, apparatus for studying the corrosion of metals. A good example of special equipment designed by the Bureau for its investigational work. By means of cranks driven by an electric motor the specimens are alternately dipped in a liquid and exposed to the air. In this way the effect of exposure of metals to water or some other liquid and the atmosphere is duplicated in the laboratory. Such investigations, carried out in an absolutely unbiased manner, yield results of far-reaching importance to manufacturers; the results, of course, being available to all.



A machine for the endurance testing of tires. The tires are pressed against the large wheels with a load equal to that which they would be called upon to support in actual service. The rim speed of the large wheels is 30 miles per hour. Cleats on the rim simulate bumps on the road. In this way the relative merits of different types of tires are determined.

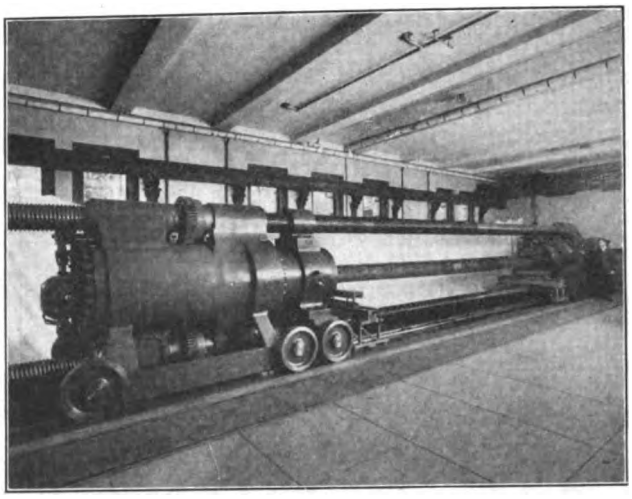


The experimental paper mill. In many lines of work the formulating of standards requires a study of actual manufacturing processes. This can not usually be done in a commercial plant. The Bureau's equipment, therefore, includes several small machines which are duplicates in everything but size of the large machines found in factories.

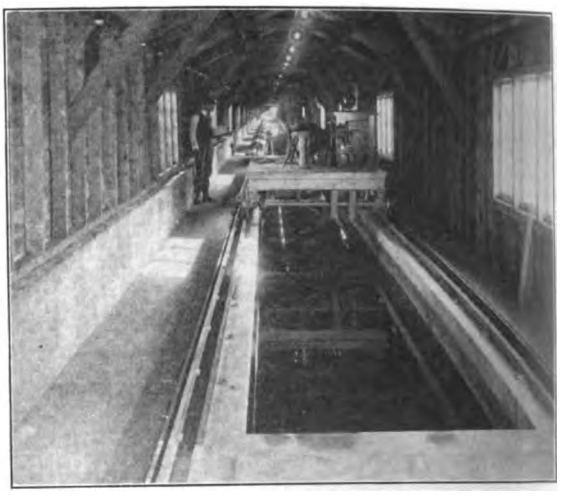


View in one of the textile laboratories, showing the complete installation of cotton machinery. As in the case of the paper laboratory, factory problems can be studied and taken into consideration in setting up standards for the industry. The Bureau coöperates to the fullest degree with each industry, and thereby benefits both manufacturer and ultimate consumer.

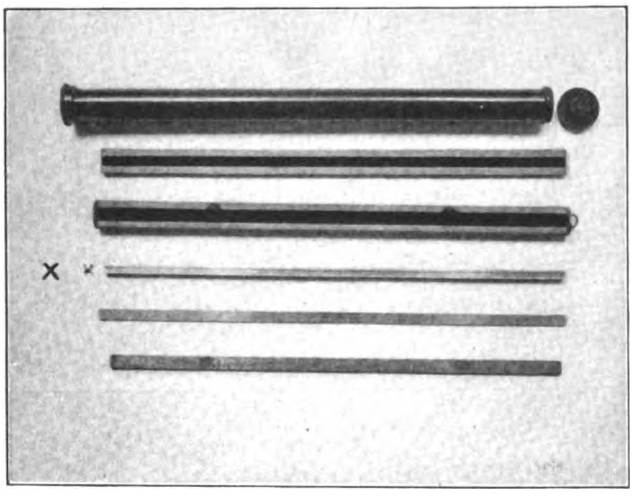
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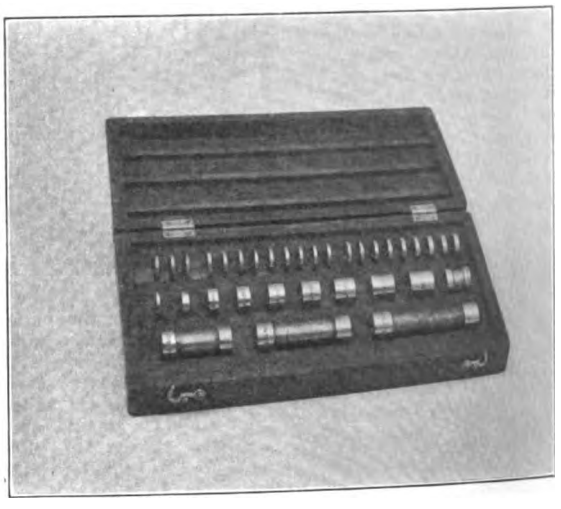
The Bureau's high precision testing machine. This machine can exert a force on the specimen being tested of 1,150,000 pounds in tension and 2,300,000 pounds in compression. It is so sensitive that a change of load of one or two pounds can be detected. The machine was designed by Mr. A. H. Emery of Glenbrook, Conn., and is hydraulically operated. Oil pressure in the cylinder at the left moves the straining head thus putting the load on the specimen; in the case shown, a long steel column. The weighing of the load is accomplished by oil pressure on a metal diaphragm at the far end of the machine, this pressure being transmitted to a second diaphragm which operates a scale.



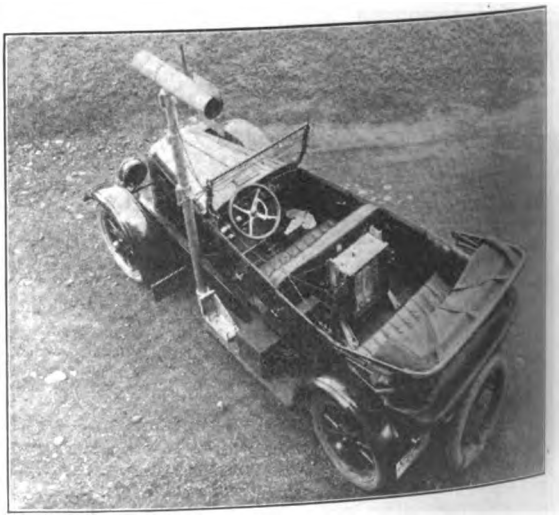
Current meter rating tank. Current meters are used for measuring the flow of water in rivers and other open channels. For testing the accuracy of these meters the Bureau suspends them in a tank 600 ft. long and moves them along at any desired speed by means of a small electric car.



The fundamental standard of length of the United States is Meter No. 27, shown opposite the mark, X, in this picture. The bar is made of an alloy of platinum and iridium. It is of peculiar cross-section, as illustrated in the end view. The standard length is taken between very fine rulings on the "neutral axis" of the bar, which falls at the top of the web. This bar, with one exactly like it, was furnished to this country by the International Bureau in Paris in 1888. It is kept in a vault at the Bureau of Standards, and all the working standards are based on the distance between the lines on this bar.

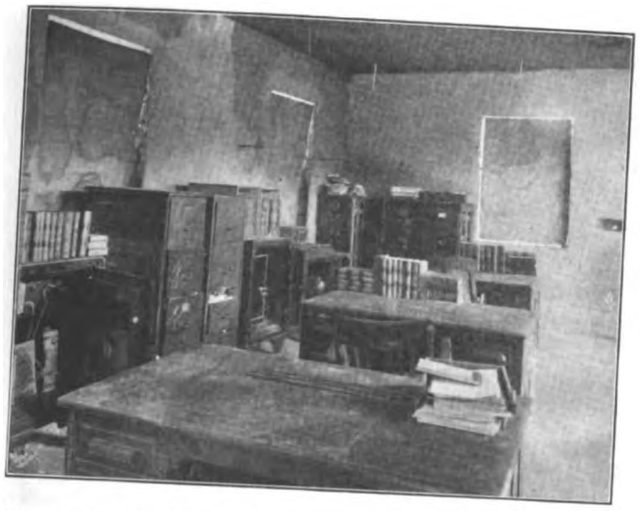


Above, a set of precision gauges made in the Bureau shops. Using a system developed by Major Hoke during the war, precision gauge blocks can now be produced in this country, which are as good or better than those formerly imported from Sweden.



At the right—Automobile fitted up for road tests to determine the value of every factor which affects the operation of a motor car. In every test which the Bureau conducts an effort is made to duplicate actual service conditions. In this particular case recording devices show the speed of the car, direction and speed of wind, fuel consumption, temperatures at various points, etc. The "periscope-like" arrangement is for measuring wind speed and direction, while the small device just ahead of the front seat photographs the flow of fuel to the carburetor.

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Above—Fire test house fitted with discarded furniture to simulate an office occupancy. The thermocouple protection tubes, used for indicating temperatures developed during the fire, are shown projecting through the ceiling.



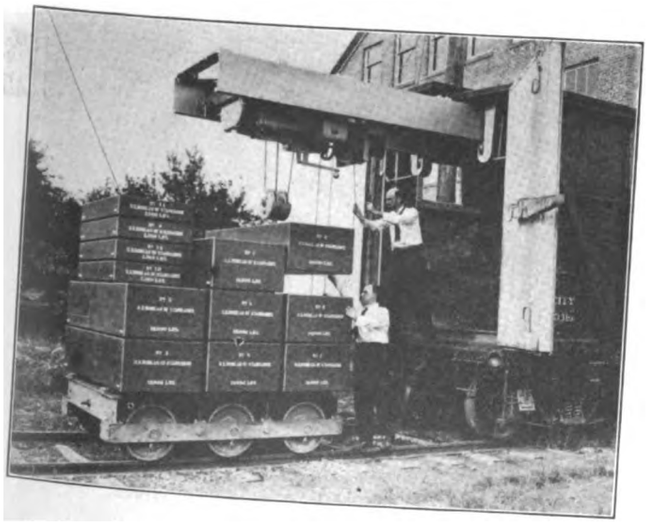
Above—A fire test in progress. The intensity and duration of fires is studied by actually burning out a small building specially built for this purpose. Temperatures are indicated by electric thermocouples. Through work of this kind data on the conditions which building materials must meet, are being accumulated.

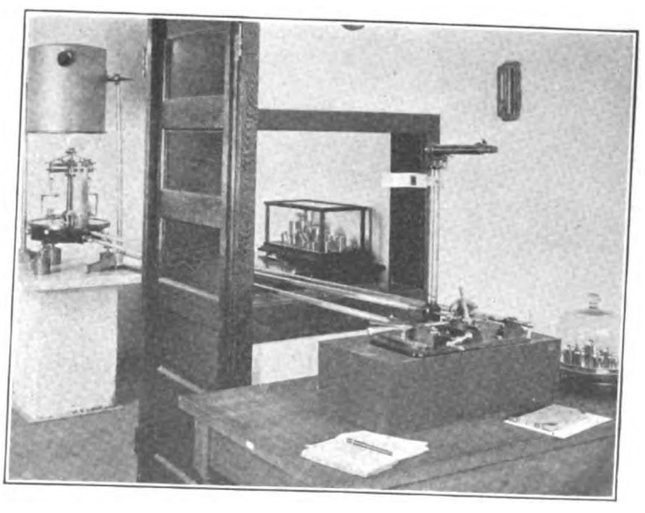


All that's left after a fire in the Bureau's test house. Scenes like this are a daily commonplace in any city; but in this case, by means of the thermocouples shown in the upper illustration, it is possible to determine the conditions actually obtaining within the room. Fire-resisting materials soon show what temperature they will safely withstand, and it is also easy to show how readily combustible furniture adds to the heat of an "ordinary" fire.

Equipment for testing railroad track scales. The Bureau of Standards maintains two of these cars, which were specially built for transporting accurately calibrated dead weights. These are loaded on a small truck also carried by the car, and the truck is then run onto the scale. In this way the error of the scale can be determined. The tolerance decided upon by the Bureau, which ought not to be exceeded by a scale in good conditon, is 0.2 per cent. of the applied load or 200 pounds in 100,000. The importance of this work to all shippers is obvious.

The most accurate balance at the Bureau of Standards used for weighings where the highest possible precision is required. The balance will compare two one kilogram weights (about 2 pounds each) with an accuracy of 1 part in 100 million or to 1 fifty millionth of a pound. The operator stands in a separate room and controls the balance by means of the long rods. The swing of the beam is read through the telescope shown in the right foreground.





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The Adaptability of the Tiering Truck

By Matthew W. Potts

THE majority of tiering trucks are operated by electric motors, which obtain their power from storage batteries, but recently a gasoline operated tiering truck has been placed on the market, and one of this type is shown in Fig. 4. It will be noted that the same principle of the cantilever platform, and upright supporting members for same, is incorporated in the design of this gasoline driven unit.

Tiering trucks were primarily designed for the piling of materials, but after they were in operation for a short time it was found that they could be used on a number of operations. Today this type of truck is used more for transporting of materials, and for special operations than it is used for the piling of materials in storage. Now the tiering truck is recognized as combining the advantages of a high and low lifting truck, and many manufacturers are putting out models such as the ones shown in Figs. 1, 9, 11, 12 and 13 so that this type of truck can be used for intraplant transportation. By having the upright members short, the truck is able to pass through doorways, passageways, etc., where the head-room is limited, and at the same time provides a unit which can operate over rough ground, and which will pile to a certain limited height if it is necessary to do so.

By referring to Fig. 2 we see the advantage of using a standard tiering truck for the handling and piling of materials in storage. It has always been a rather difficult task to handle and pile radiator sections. Thus if one or more handlings could be eliminated, the accident hazard and labor cost would be materially reduced. By using this type of truck for handling there is no need to pile the radiator sections in storage or to handle them when taking them out of storage, as the whole skid load is placed mechanically by the truck. This method of tiering skid loads also conserves floor space, and permits the proper use of head-room. Within the last two years executives have been taught, and made to realize that warehouse space should be figured on the cubic foot basis, and not the square foot basis.



Fig. 1. This is a low type tiering truck which is recommended for hauling over rough ground. Note the big wheels.

In 1921 the Merchants' Association of Greater New York found upon investigation that the cost of handling materials on piers and docks was rather excessive. For example, it was shown that on one cargo of Fuller's earth from England, the cost of loading the material from the pier floor to the tailboard of a motor truck on a New York pier, was one-half the freight cost for bringing this same material across the ocean. Many attempts have been made to mechanicalize the handling operations on these piers, but it is only recently that any great progress has been made other than at railroad



Fig. 2. Tiering trucks were originally designed for the piling of materials loaded on skids.



Fig. 3. One of the first uses other than for the tiering of materials was the loading of automobile trucks when shipping platforms were not provided.

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Fig. 4. Gasoline operated tiering trucks have recently been designed. This is one of the first illustrations of such a truck.



Fig. 5. The handling of dies to and from punch presses is an operation which can be best performed by tiering trucks.

terminals. At the present time a number of electric trucks have been rented to stevedore companies, and others have been sold to these companies, and it will not be long before a number of tiering trucks will be performing the operations as shown in Fig. 3. By using electric trucks the cost of raising materials from pier floors to tail-board of trucks should be materially reduced, and this reduction should be passed along to the shippers.



Fig. 6. Many production operations, such as the charging of furnaces, can be speeded up by applying a special platform to a standard tiering truck.

Those companies which have a number of punch presses in operation, and who are using tiering trucks for handling the dies have found that this equipment not only reduces the handling cost, but it speeds up the operation of changing the dies, thus increasing the operating time of the production equipment. It is always well to consider materials handling equipment not only as a medium of transportation, but also as a direct aid to greater production. One industrial plant found upon investigation that the changing of dies in their forge rooms required from two to five hours each, and that the operation required from three to four men. Their annual cost, figuring 300 working days when using hand methods, amounted to $33,600.00 for changing dies. This sum includes both labor, and production losses due to idle equipment. By installing proper racks for storing the dies, and by using a tiering truck for handling and transporting them they reduced this cost to $1,500.00 over the same period, making a saving of $32,100.00 per year. Such amounts are not unusual in the savings effected by using mechanical methods for handling materials.

As the tiering truck found its way into industries the principle embodied in the truck adapted itself to many peculiar operations, and the manufacturers were called upon to develop and build a number of special trucks for certain operations. Fig. 7 shows a special tiering truck two-thirds of which is standard design while the

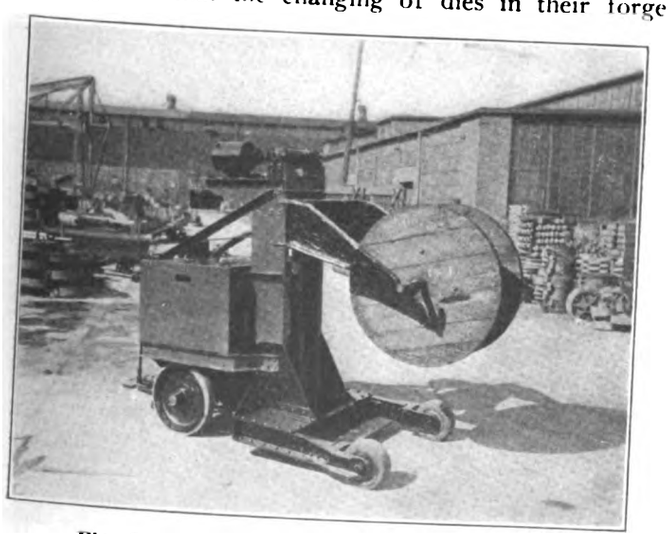


Fig. 7. This truck is two-thirds of standard design while the other third is built special for this particular operation.

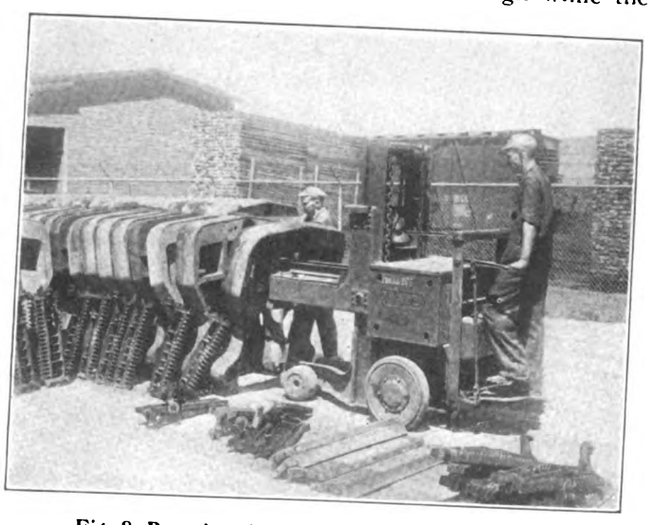


Fig. 8. By using the tiering truck principle with special adapted platforms many cumbersome pieces can be handled.

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Fig. 9. It is well to compare each make of truck so as to see how the same principle is adapted to each manufacturer's design.



Fig. 10. This special attachment on the end of a standard tiering truck provides a simple means of handling bars of lead or copper.

front forks and cantilever elevating arms are special. The use of this truck is portrayed in the illustration, and no doubt a similar truck could be used for many other handling operations in different industries.

To show how the tiering truck can be made to handle cumbersome, and odd-shaped pieces we present Fig. 8. These furnace sections are heavy, and very difficult to handle, particularly if man power is required. By shortening a standard tiering truck platform, and mounting special projection arms on same it is a simple operation for the tiering truck to pick up, and handle these parts. Similar adaptation of standard tiering trucks have been used in wire mills and tire plants for handling products in process.

It is not always necessary to fit the operation to the truck for quite often the truck can be designed to handle the part or containers which already exist. For example, Fig. 9 shows a new way of handling chip barrels to the oil extractors. This truck is built on the tiering truck principle, and was designed to handle existing cans after they had been fitted with an angle-iron ring, which the truck arms could come in contact with in order to support the can.

The handling of bar lead, copper and pig iron has always been difficult, but electric truck manufacturers have designed several special devices for handling such materials. The truck in Fig. 10 shows a device attached to a short tiering truck platform, and which is handling this class of material. The tiering truck permits elevating of the load for charging melting pots or for piling the material. It will be noted that the load consists of thirty-five bars which are handled at one time. Another special attachment for this same type of truck is shown in Fig. 11, where a device for picking up four kegs at one time has been attached to the truck.



Fig. 11. This is another special attachment on the standard tiering truck, and shows the method of handling kegs or barrels.

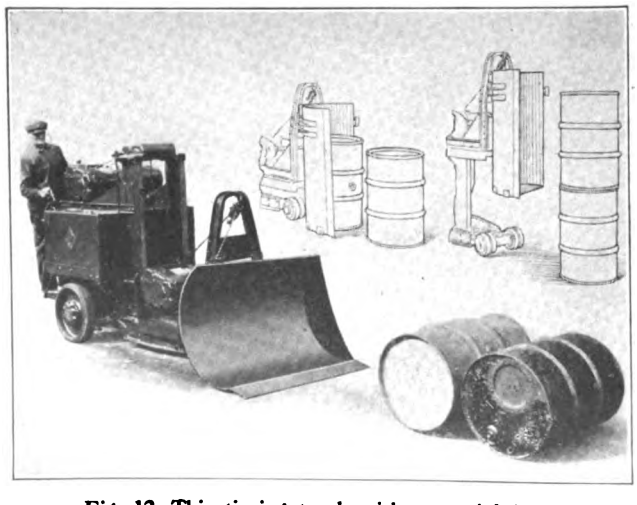


Fig. 12. This tiering truck with a special front end attachment was designed for handling drums, barrels and rolls of material.

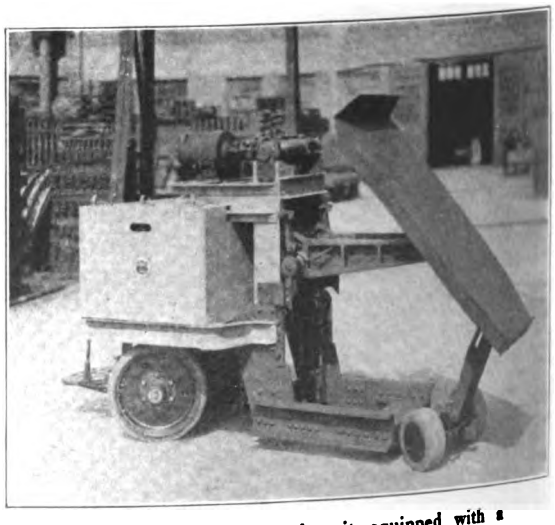
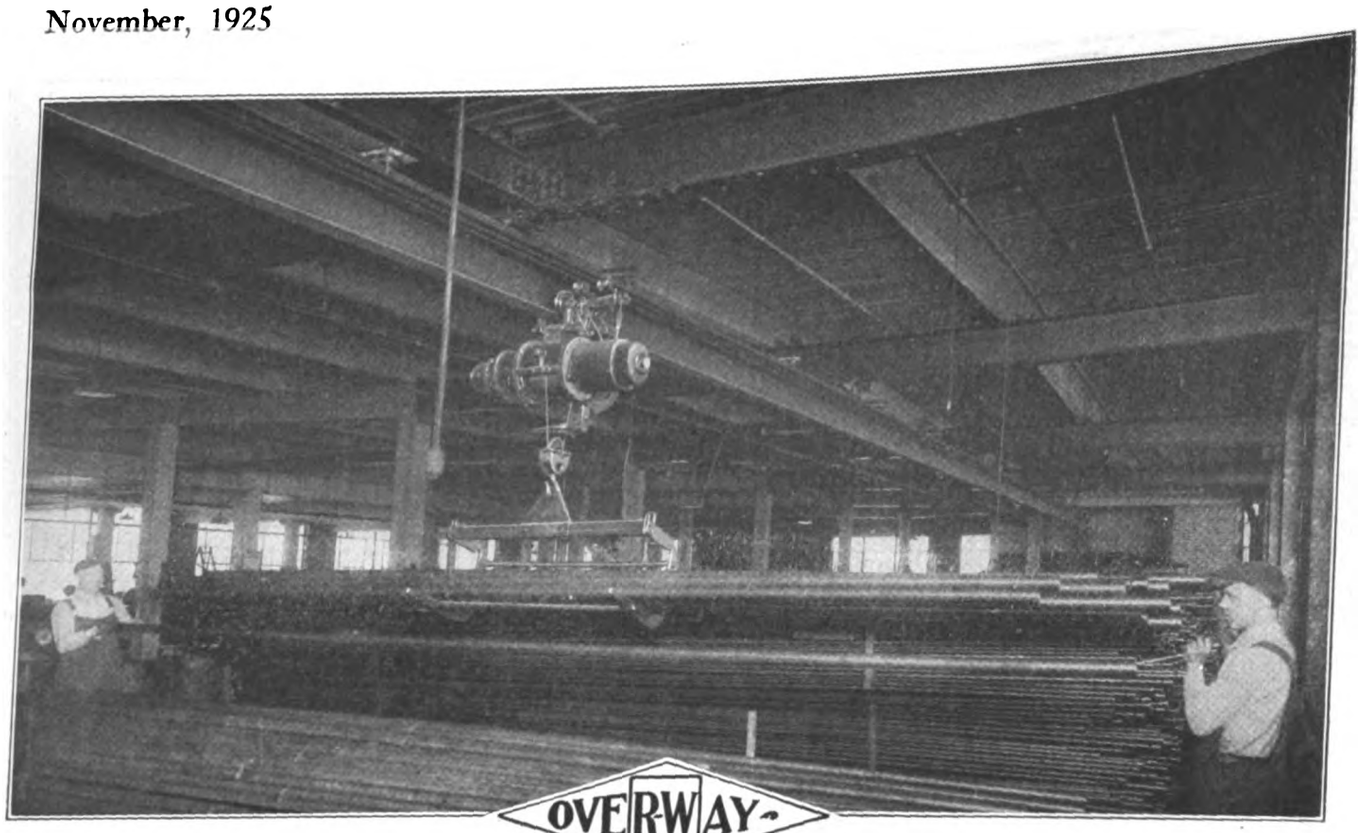


Fig. 13. This standard unit equipped with a special front end provides an automatic dumping arrangement for loads carried on the platform.

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"But without this saving it is an essential piece of equipment, for it would be almost impossible to handle our present volume by hand, even if we could keep men on the job."

Richards-Wilcox Mfg. Co.

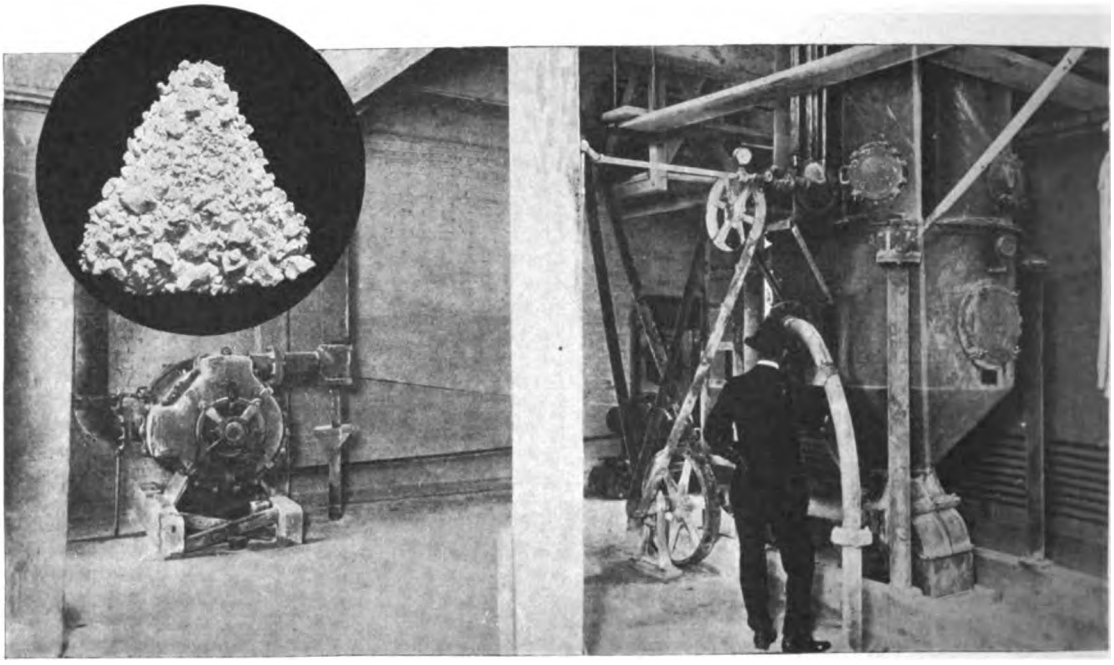
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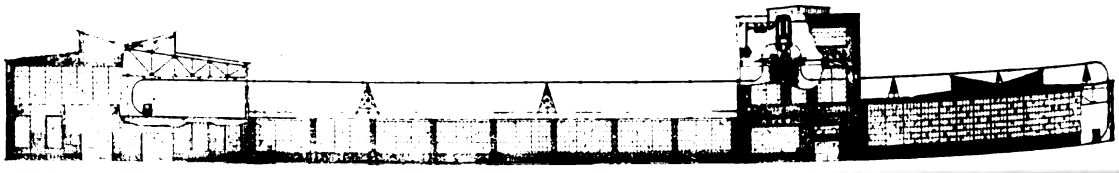
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Fig. 12 shows how a special truck has been built into a tiering truck so as to bring about a combination for handling and tiering of barrels, drums and roll material. The attachment on the front end of this tiering truck

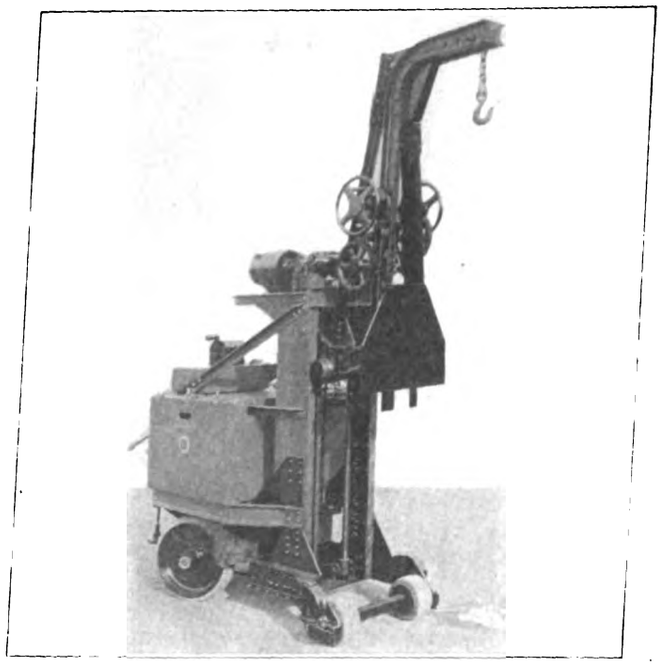


Fig. 14. This is an extra special job, but shows what can be done with a tiering truck principle when circumstances require.

was originally designed for handling roll paper, but by mounting the entire unit on a tiering truck platform it has also been made possible to pile this same class of material with the one truck. The photograph shows

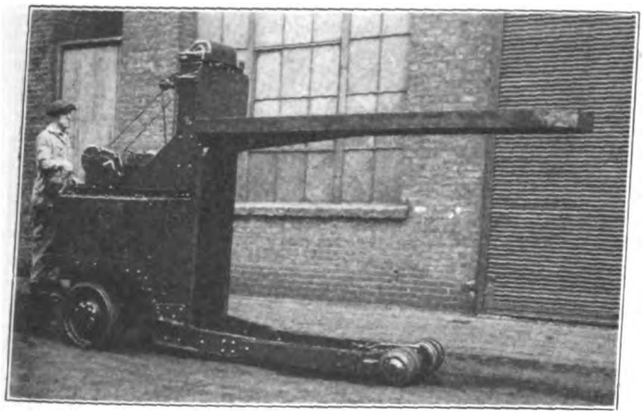
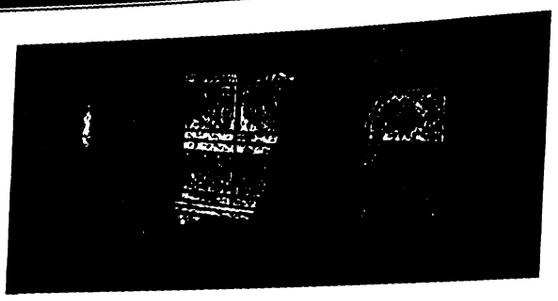


Fig. 15. When tiering trucks were first designed platform lengths were limited. This one is over 10 feet long.

how the truck approaches its load for pick-up while the two sketches show how it can also pick up the load in a vertical position and pile same in a vertical position if desired.



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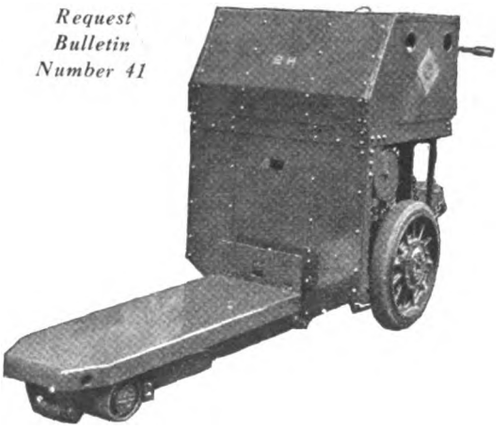
The electric has the advantage of hauling up inclines as well as lifting and transporting by electric power.

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First Aid for the Pipe Worker

Some Improved Tools to Speed Up Pipe Cutting and Threading

By Frank Edwards

FOR generations the plumber, the steam-fitter and the general handy man have practised the art of cutting and threading pipe in much the same way with much the same kind of tools, accomplishing a vast amount of hard work with results almost directly proportionate to the individual skill of the artisan.

It would be strange, however, if the well-known ingenuity of the American inventor had not been directed to the problem of simplifying this work, making it easier and faster. And a very short search of the shelves of any large mill supply house reveals several very interesting new devices for this purpose.

There has always been room for improvement, for instance, in the familiar old pipe cutter, with its sharpened wheels or rollers. It needs a good eye, and good cutting judgment to operate this tool so that the pipe may be cut off with a square end. Even with these qualifications the worker usually "squeezes" the pipe, making it necessary to ream out the burr on the inside, and to file off the burr on the outside.

But here is a pipe cutter (Fig. 1) that needs no special skill to operate, yet always cuts a square end, without burrs. The reason is found in the fact that it works like a lathe. Two wide V-shaped jaws slide around the pipe in such a way as to keep the two vanadium steel knives always at right angles to the length of the pipe, thus securing a square end cut; and the knives are so shaped that the cutting edges follow guides which permit only thin ribbons of metal to be turned off at each revolution of the tool. Speedy and easy to work, with uniformly better results because the cutting judgment is concentrated in the tool instead of the workman!



Fig. 1. This square-end pipe cutter works like a lathe turning off thin ribbons of metal at each revolution of the cutter.

The shape of the knife used in this square end cutter is very clearly shown in Fig. 2, which illustrates a larger size of the same tool with ratchet drive and automatic knife feed. Still larger sizes are made with pinion and worm gear drive and four knives, enabling one man to cut pipes up to 12 inches in diameter —all straight, true and square-

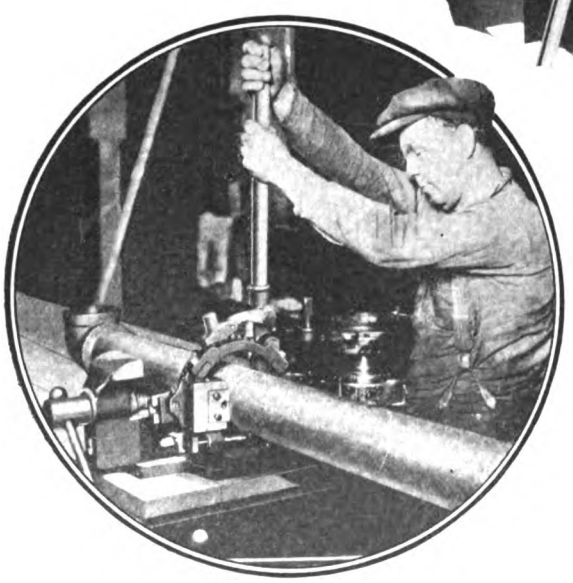


Fig. 2. A big-brother version of the same pipe cutter. Here a ratchet drive pulls the vanadium steel knives around the pipe, cutting square and true.



Fig. 4. A modern ratchet-drive die-stock with adjustable head to thread several different sizes of pipe, and adjustable centering chuck to fit each size of pipe smoothly.



Fig. 3. The familiar die-stock, with full complement of attachments, just as used for generations past.

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Fig. 5. Locations like this call for a special die-stock. The one pictured has a ratchet-drive that takes six different unit heads, threading pipe from ⅛" to 1"

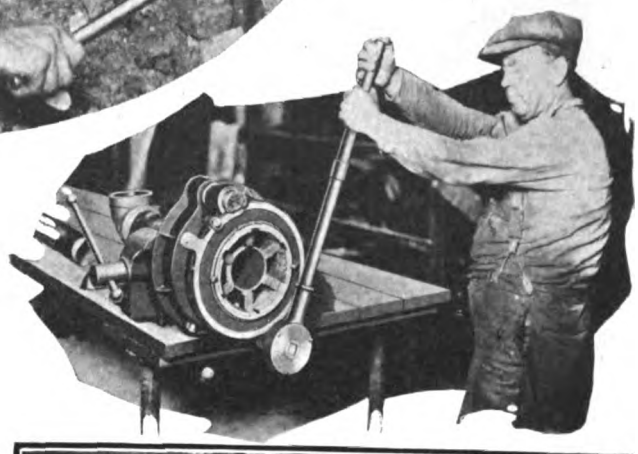


Fig. 6. This is a real he-man pipe threader, adjustable to take various sizes of pipe up to 12" O.D. The powerful ratchet drive enables one man to work it with ease.

end, with neither inside nor outside burrs.

In Fig. 3 is illustrated the full complement of parts for the old-fashioned pipe-threading die-stock, such as our fathers used, and cussed at every time a different size of pipe had to be threaded. A notable improvement of time and temper saving efficiency is shown in Fig. 4. Incidentally it is pictured doing a job impossible for the old time die-stock. Here is a completely self-contained die-stock in which eight cutters may be set in the twinkling of an eye by simply turning the dial, so that any one of several different sizes of pipe may be threaded without changing any part of the tool. In addition an adjustable guide at the back end of the die-stock may be instantly centered to fit the size of pipe to be threaded. These advantages, coupled with a ratchet drive make pipe threading in hard-to-get-at places simple.

But Fig. 5 shows a situation that does require a special tool to work in. And the tool is simply a special form of ratchet in which six different complete die-heads fit, to cut threads on pipe from ⅛ inch to 1 inch O. D. These die-heads snap into place so securely that they will not fall out even when the die-stock is used in an inverted position, as when working under a ceiling. In Fig. 6 we see a real he-man die-stock, ratchet-driven, and adjustable to thread pipe up to 12 inches O. D. One man operates it without difficulty and with fair speed, thus taking the place of heavy, expensive power-driven machinery.



But, speaking of power machines, in Fig. 7 we have a *portable* power drive for pipe cutting and threading work, weighing complete only 230 lbs. and operated by an electric motor from the ordinary lamp socket. There is a built-in vise in this piece of equipment aided by a self-centering auxiliary chuck, both being self-locking.



Fig. 7. Something really new is this portable power drive for pipe work. It weighs only 230 lbs. complete, with motor and may be operated from the ordinary lamp socket.

As shown in the close-up

Fig. 8. "Take it to the job on the Ford" is the motto of this Cleveland plumber. He thinks this portable drive is a real time and money saver.

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Can we dispense with dialogue—discard drama completely—and yet be able to correct age-old misjudgments about these extremely important equipments in modern industrial buildings?

This question was recently asked by one of our executives. If you think the affirmative answer was justified your attention is assured for what follows. It's easy reading and interesting.

A Preference and its Cost

WHEN Grinnell Company is as low a bidder as anyone else on a piping contract, or on a specification for fabricated material and piping supplies, Grinnell Company is almost invariably awarded the business.

That, perhaps, is the most significant fact in the piping world. It can mean only one thing. Grinnell work—manufacturing, interpretations, engineering, contracting—is better. Grinnell superiority is recognized and preferred by the experienced buyers of sprinkler, power and heating equipments and piping supplies.

Too often, however, buyers are unwilling to pay the cost of their preference. They want the best results, but they insist on the lowest price. They forget that the very factors that make them prefer us are the very factors it costs us money to provide. As a contractor, Grinnell Company cannot fly by night because, as a manufacturer, it has the solid roots of a $10,000,000 capitalization with all that means in the way of financial responsibility.

As a contractor Grinnell Company is not a jack-of-all-trades serving a few counties, but a service organization which for 70 years has specialized on piping throughout the United States and Canada.

Although a national, interstate organization, Grinnell Company is local in every part of the country, with ten strategically located manufacturing and fabricating plants and warehouses.

Further to bring to local service all the experience and equipment of a national specialist, Grinnell Company has thirty offices in principal cities from coast to coast, in each of which competent engineering corps furnish close personal coöperation with architects, consulting engineers, plant engineers and owners.

Instead of placing reliance on labor picked up on the job for the job, Grinnell Company employs a permanent road operating force of over 1,000 men, in charge of 200 traveling construction foremen, under the supervision of 40 general foremen. This assures anybody that the Grinnell construction standard in Maine is the Grinnell standard in Oregon.

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With the usual contractor a specification is often interpreted by an organization which has not the engineering talent to understand what the consulting engineer or architect desires. The pipe on such a specification is often reamed by crude hand methods on the job or in some local pipe shop. Either it must be installed by the contractor, no matter how it measures up to the specifications, or else the installation work is delayed. The specification is handled by several separate and distinct organizations. Each has discharged his responsibility when he has done his part.

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view, Fig. 8, a pair of projecting arms hold the handles of a die-stock and in revolving, turn the pipe-tool around the pipe smoothly and more accurately than by hand. All that is necessary is to set the pipe in the vise jaws, tighten up the chuck, set the pipe tool in place in the arms, turn on the current, and watch the work! It is

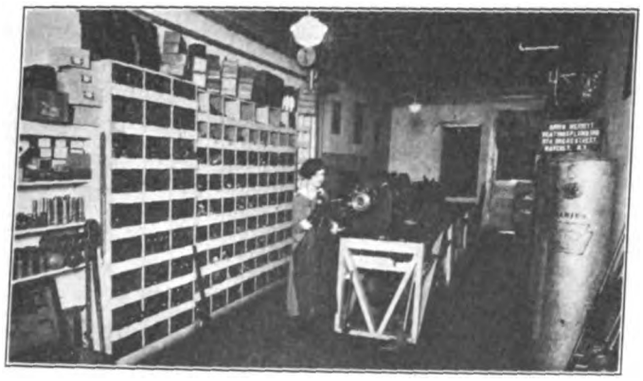


Fig. 9. So simple is this portable power drive to operate, that this plumber's stenographer frequently takes a hand in the shop to turn out a rush job.

so simple that the stenographer working in the office of the plumber who has the power drive illustrated in Fig. 9 frequently takes a hand in the shop to turn out a rush job.

Fig. 10 shows the ordinary pipe cutter set in place



Fig. 10. A close up view of the same portable power drive, showing how the ordinary pipe cutter is revolved around the pipe by the projecting arms.

to cut off a length of pipe with this portable power drive. The cutter is revolved around the pipe so truly that a good, clean, square-end cut *must* be made with ease.

With tools such as these, better and faster work may be done with considerably less muscle strain and more all around ease than with the devices of our forefathers. Be up to date with your pipe-cutting and threading equipment—it pays in many ways.



Two open Durand doors supporting eight men. That calls for solid hinge and door construction.

Defeating the Heavy Hand of Time

Time lays a heavy hand on lockers that are not built to withstand it. The scuffs, the slams, the bumps and the mistreatment incurred over a period of years can exact high toll in appearance and serviceability.

To defeat this toll, exceptional sturdiness is built into each detail of Durand Steel Lockers.

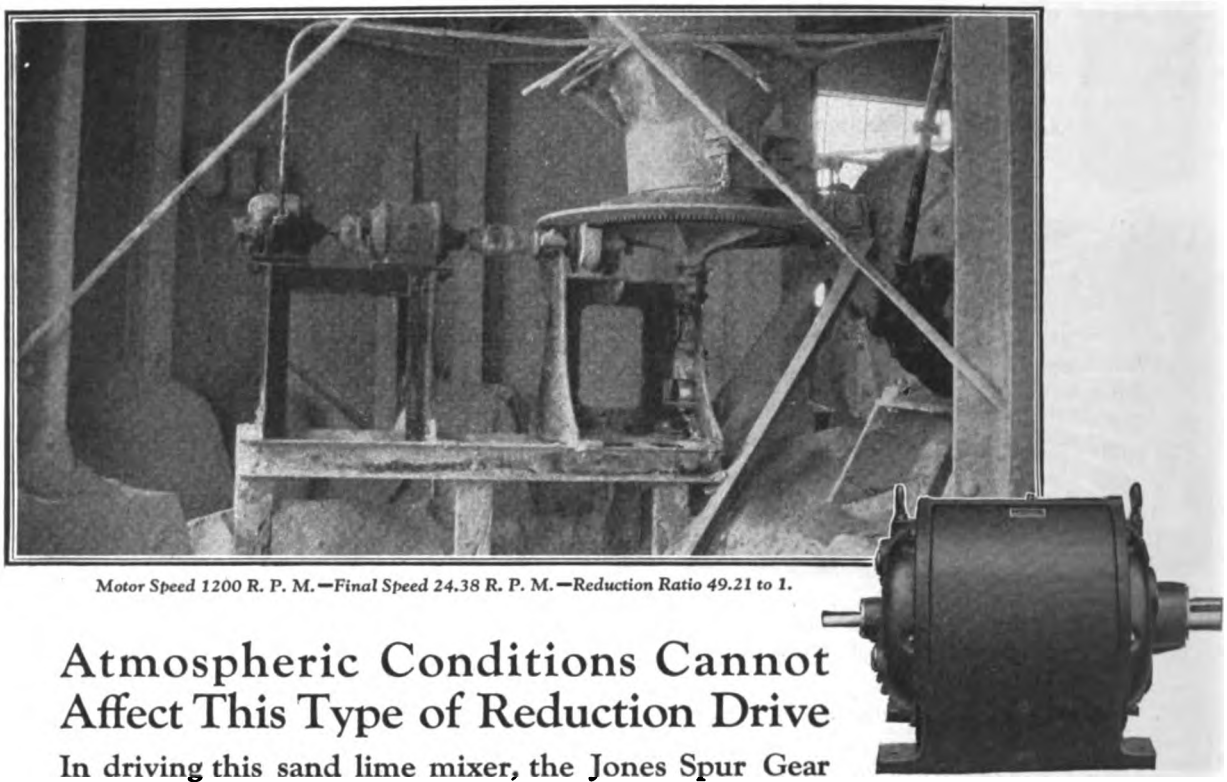
The frames are of full length angles, solidly welded together. The doors are of 16 gauge steel. Compact and husky, hinges are spaced at frequent intervals on the doors. Enamel is baked on to provide a lasting, lustrous locker finish. Parkerising keeps hooks, bolts and similar parts free from rust.

How completely such construction details as these defeat the heavy hand of time can be best noted after an installation has seen years of hard usage. Inspection then will show that Durand Steel Lockers look and function as well as they did the day they were installed.

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The Industrial World In Miniature

Models that Bring the Product or the Process Before the Consumer

By Roscoe W. Good

THE consumers and users of the products of industry, in general know very little as to how their daily life necessities are made. It is natural that all of us are not interested in industry, but it is most interesting to know and have some understanding as to that which constitutes the basis of our present-day living conditions; where the raw product comes from, how it is shipped to the place of manufacture, what process it goes through, what changes take place during the course of the process, and lastly how it is packed and shipped until it reaches the place of use or consumption.



Fig. 1. Showing all the major details of a prospective home, by means of a model prepared from architect's specifications.

The greater number of people are interested in this subject, but it is inconvenient and mostly not possible for them to visit all the great manufacturing plants of the country and learn these facts, furthermore, the process being on such a large scale, it is very difficult to obtain an understanding even though explained by a guide; also the number of people who do or have the privilege of paying these visits are but a fraction of a percent. of those interested in the process.

Every industrial firm active in its field carries on sales advertising for the purpose of selling its product. Regardless of the demand, all of industry depends on advertising, for it is the publicity work that brings those who create the demand for a product in direct contact with those who can fill it. There are of course several firms who are prepared to supply the demand, and it rests with the prospective purchaser to make a choice as to which product or service best suits his purpose.

The convincing manner in which to show superiority is naturally in reality of operation, and this is where the model or reproduction in miniature plays its important role.

The making of models is an art and the work is executed by artists who have a natural aptitude for this work, because as yet there are no schools known to the writer of this sort, that offer courses of instruction along these lines; even then the natural artist is the better.

The complete process of the most complex sort can be incorporated within a few feet of space or can be made yards square, depending on the detail desired, and of course the prices range accordingly from a few dollars to many thousands, for it takes many patient hours to reproduce just one minute part correctly in creating these reproductions.

Models are not only used for sales purposes, but for instruction in schools and in industrial plants and for use of efficiency experts; construction firms have models prepared of the project or building so that they can see their finished work in advance and make any changes necessary, also for the benefit of those financing the con-

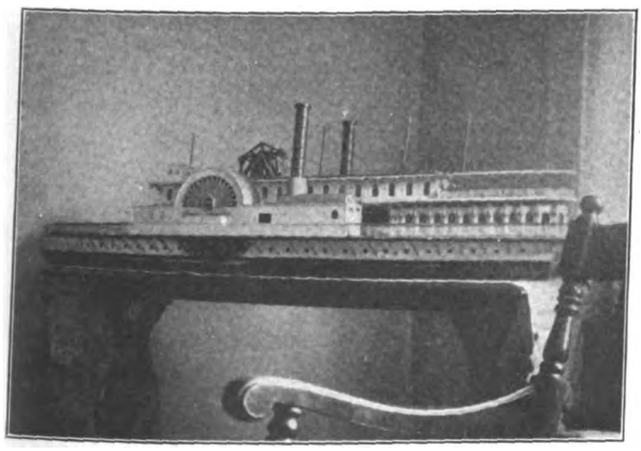


Fig. 2. A model of the "George Washington," Hudson River Steamboat. Ship models are among the oldest examples of the model maker's art.

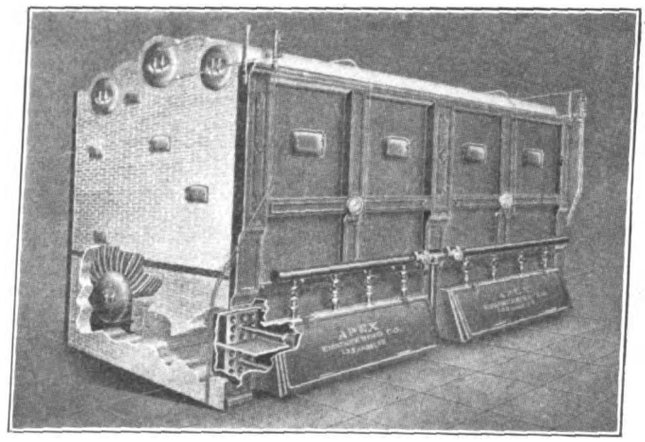
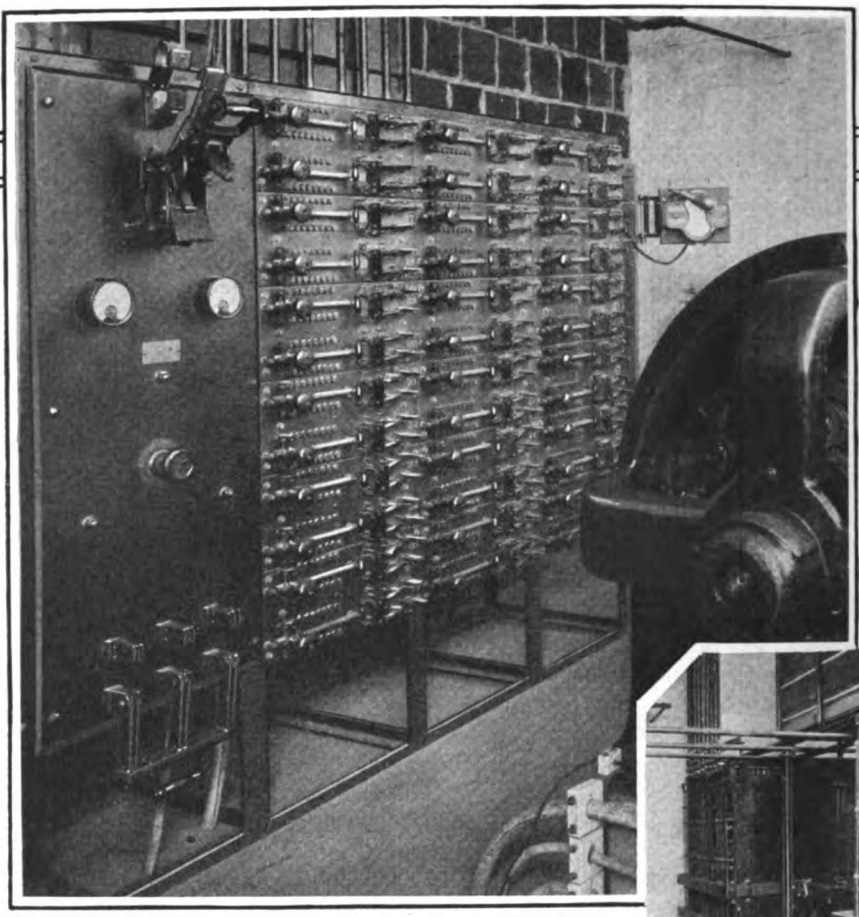
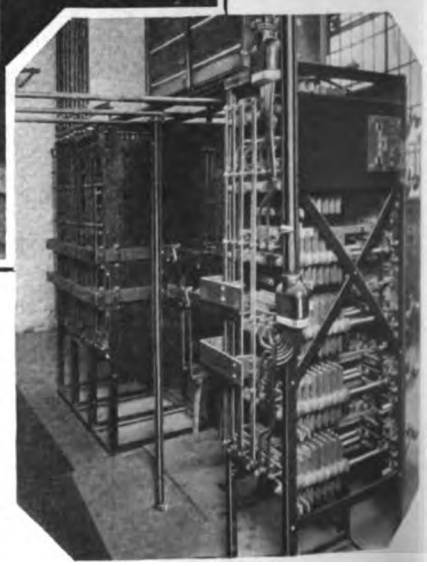


Fig. 3. Such a model as this is of the greatest value for demonstration purposes, both in sales and in educational fields.

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Consolidated Battery Corp., Buffalo, N.Y., manufacturers of storage batteries: Front view shows 36 of the C-H duplex battery charging panels. With C-H Rheostats every step is a positive value, unaffected by vibration or constant use. Below—Rear view showing arrangement of mounting.



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From early days to the present time Cutler-Hammer Engineers have given their time and effort to the development of suitable battery charging equipment with the result that today thousands of these units are caring for battery-driven street vehicles, trucks, tractors, locomotives, etc.—keeping them fit for everyday service.

Full information with an interesting discussion on the different methods of charging is given in Pub. 830. Send for it.

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BATTERY CHARGING EQUIPMENT

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struction; sales firms use replicas to effect sales of properties; and one of the large uses is for record purposes showing past accomplishments or development; then there are countless other uses according to the nature of the organization and the work to be accomplished.

The model maker generally obtains photographs and drawings of that which is to be reproduced; then he prepares drawing the actual size the model is to be to a certain standard scale, say one-sixteenth, or one-eighth, which represents a larger measurement on the original print; then the various pieces are prepared and painted, then assembled, but during this time of construction perhaps many months or possibly years have passed because of the minuteness of the work. It generally takes about six months to make a delivery on an ordinary intricate reproduction of moderate size.

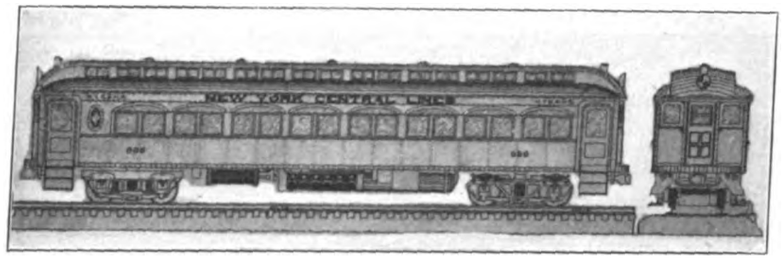


Fig. 4. Railway car manufacturers are alive to the very practical value of accurate scale models.

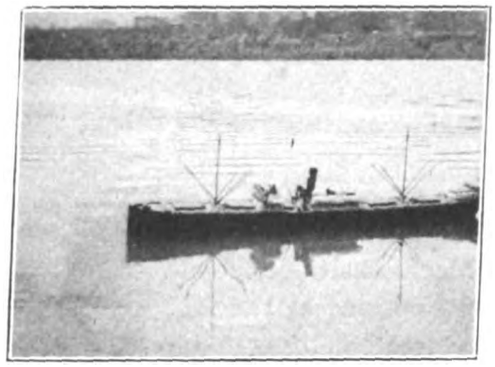


Fig. 5. Only a few feet long, this is an actual operating model of a freight steamship.

It is very effective in closing a deal to show in miniature the actual product; which makes an extra impression and is a stimulation of interest. Also, if desired, just an important feature of a product or process may be copied in miniature which may be on a larger scale than would be advisable if the whole were reproduced. The latter method is often used.

Somewhat in this same connection is the plan of using traveling sales and instruction models accompanied by either a chart or representatives. At definite periods, the firms using these displays send out into each section of the country, as they have it divided, a new reproduction showing a different feature of their product, process, or service. These may be exhibited at branch places of business or specially arranged window displays, taking advantage also of the schools for a few days of its stay in each city for instruction purposes, which is great publicity if handled properly. Expositions and fairs, if not taken care of separately, would of course come under this itinerary.

One replica in this way is used for many years without additional expense, and yet there is always a change in each district arousing new interest.

Much more could be written on the subject, but the writer has endeavored to give the members of the industrial world and those interested in the subject sufficient material so as to serve as an insight as to the possibilities in the reproduction of the industrial world in miniature.

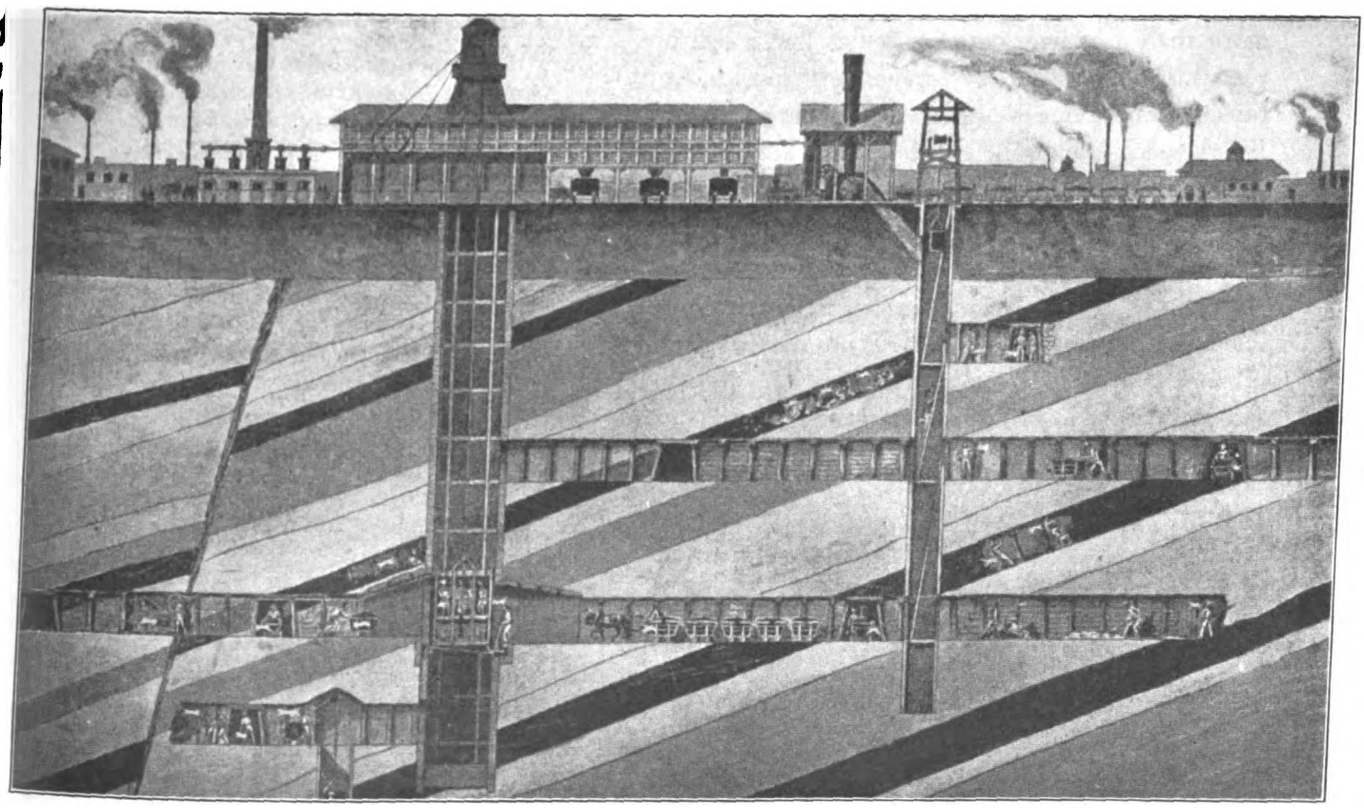
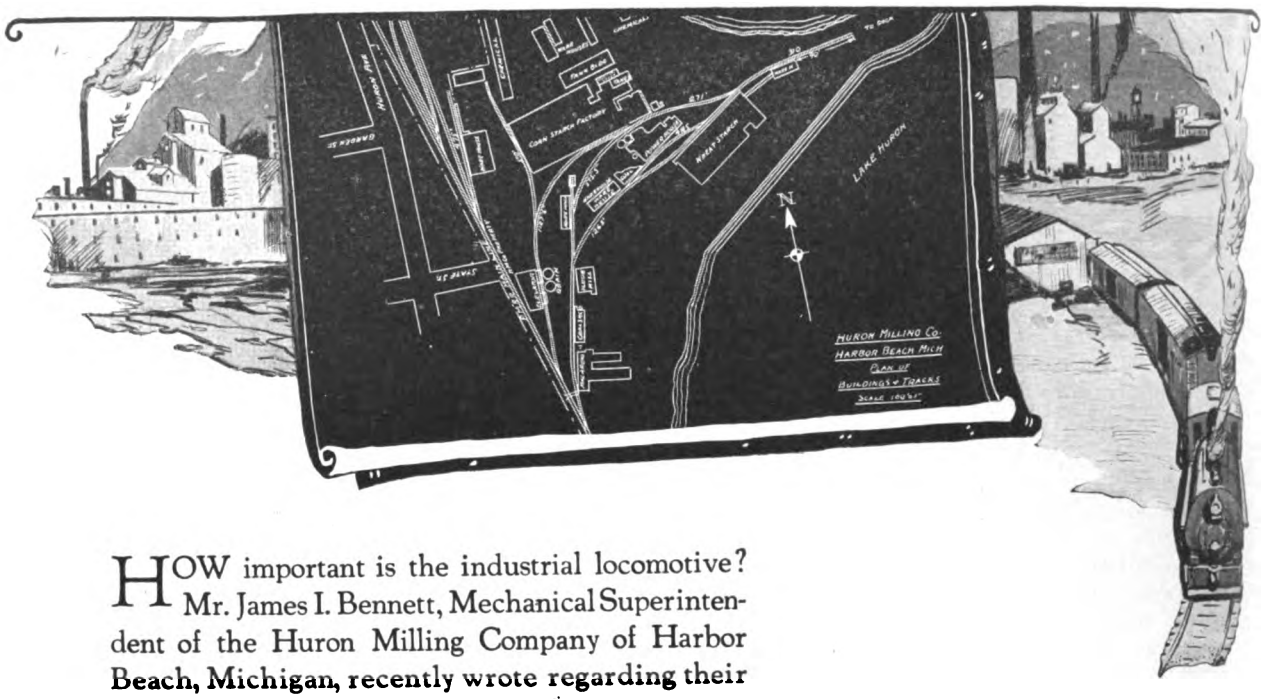


Fig. 6. A cut-away type of a model which gives, at the cost of a few minutes' study, a complete grasp of the processes carried on in an industry.

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"It Would Be Impossible for Us to Operate Our Plant Without This Locomotive"



HOW important is the industrial locomotive? Mr. James I. Bennett, Mechanical Superintendent of the Huron Milling Company of Harbor Beach, Michigan, recently wrote regarding their Davenport, "It would be impossible for us to operate our plant without this locomotive."

The Davenport is built for this responsibility. For more than a quarter century it has had a definite place in the industrial development of America. And our field of service is continually becoming greater. Every year, smaller and smaller plants are finding it profitable to have a Davenport ready at all times—to be independent of the cost and uncertainty of outside switching facilities.

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Short Cuts in Testing Skilled Workers

A Method of Checking the Applicant's Knowledge

By Herbert A. Toops

THIS is a proposed test method for hiring skilled employees in the trades or for giving examinations for promotion when promotion is to be based on the trade knowledge and skill possessed by the employee.

The method may be illustrated by application to the job of hiring a general machinist. The examiner proceeds through the examination with the following steps:

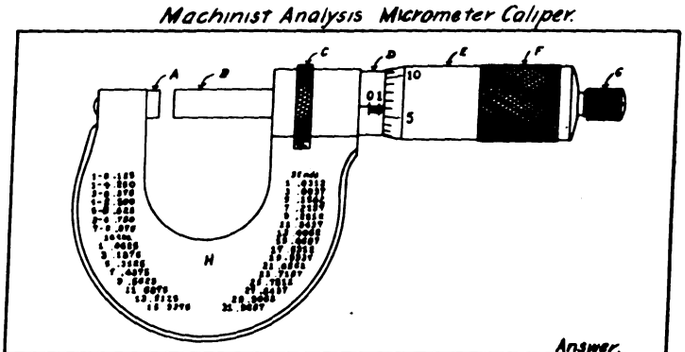
1. On a printed or typed form card, previously prepared, the examiner puts a check mark opposite the names of those *machines* on which the applicant claims experience.

2. If in the above step, the applicant claims no experience on the milling machine for instance, no further examination follow-up is made on that tool; if, however, the applicant claims experience on the milling machine, then in this second step the examiner proceeds to ask him whether he claims experience in the various *operations* which can be done on a milling machine; T-slot cutting, facing of hexagon nuts, plain indexing, compound indexing, tooth cutting, splining, slotting, key-seating, etc. As in step 1, the examiner notes any deficiencies on the card.

3. If in step 2, the applicant claims experience in T-slot cutting, slotting, etc., the examiner proceeds to give the applicant a standard set (i. e., one which is used alike on all such applicants) of questions to test his ability on each such *operation* in which experience is claimed.

It will be noted that the essence of this plan is to give a very intensive examination on only those *operations* of the total trade in which the applicant claims experience. Step 1 automatically eliminates the necessity of examining him on a large number of operations—those belonging to or with the machines on which he does not claim experience. Step 2 determines those operations which the applicant claims he can do on those machines on which he claims he has experience; and in step 3, he is *intensively* examined on these operations only. Whenever in Step 1 experience on a certain machine is claimed, the examiner should proceed at *once* to Steps 2 and 3, for the wholesome moral effect which this is likely to have upon one who might be inclined to claim an undue amount of experience if his statements were unchecked at the time. This procedure keeps the number of examinations in Step 3 down to a minimum.

Machinist Analysis Micrometer Caliper.



		Answer.
1	What do you call the part at A?	
2	What do you call the part at B?	
3	What do you call the part at C?	
4	What do you call the part at D?	
5	What do you call the part at E?	
6	What is a roughened surface like at F called?	
7	What do you call the part at G?	
8	What do you call the part at H?	
9	What does that micrometer read?	
10	How many threads per inch on the screw of that?	
11	How many graduations on the sleeve of that?	
12	What fraction of an inch = 1 revolution of sleeve?	
13	What decimal does 4 revolutions of sleeve equal?	
14	How many inches is the maximum capacity of that?	
15	What decimal is $\frac{5}{8}$" equal to?	

Name _____ Check No. _____

A typical example of the method of quick examination suggested by the author; in this case to check up familiarity with a micrometer caliper.

Illustration of a Hiring Interview Using the Method.

To be concrete, let us suppose the following were the results of such a standardized interview:

Examiner: "Have you ever worked on a shaper?" (Step 1.)

Applicant: "No." (Examiner notes "no experience" on shaper. Had the applicant answered, "Yes," the analysis would have been carried further.)

Examiner: "Have you ever worked on a lathe?" (Step 1.)

Applicant: "Yes." (On account of "Yes" answer, Examiner proceeds to Step 2.)

Examiner: "Have you ever done square thread cutting?" (Step 2.)

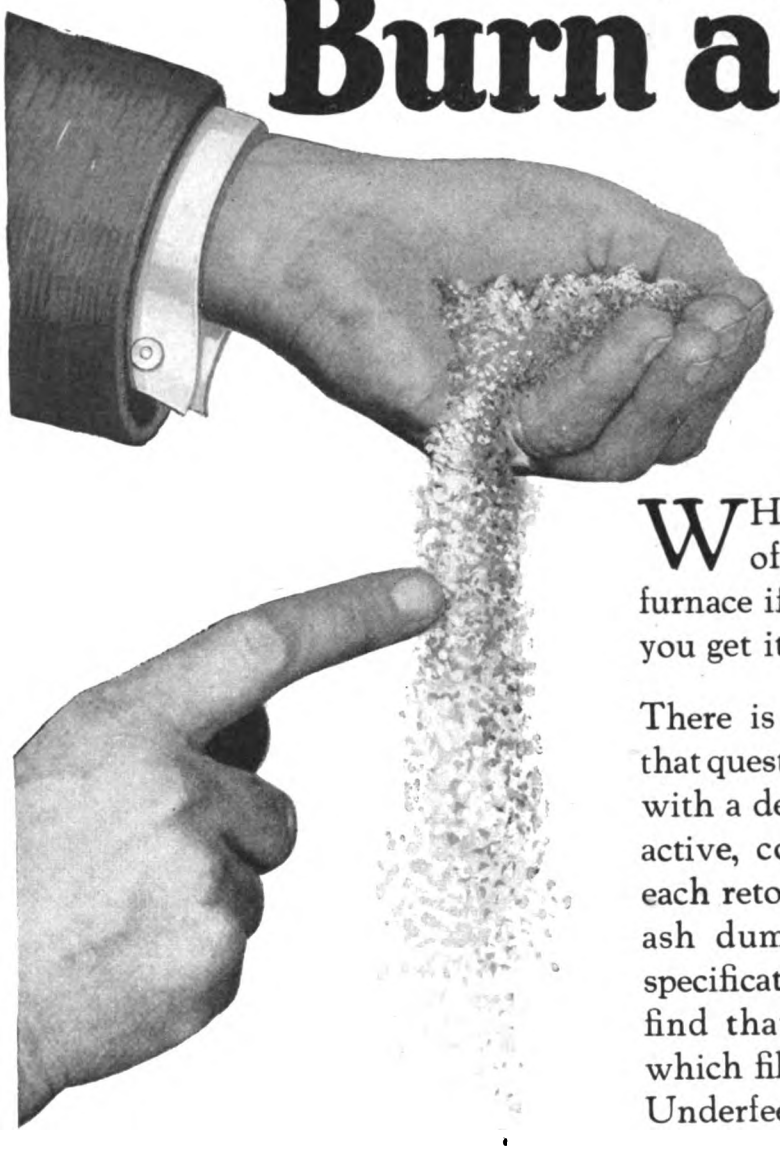
Applicant: "No." (Examiner notes the deficiency.)

Examiner "Have you ever cut V-threads?" (Step 2.)

Applicant: "Yes." (Note that the examiner does not stop to ask the unnecessary and useless question of "How long." He will now check this much more effectively by the trade test questions on V-thread cutting; if the applicant is experienced he will be able to answer funda-

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Burn all your Coal!



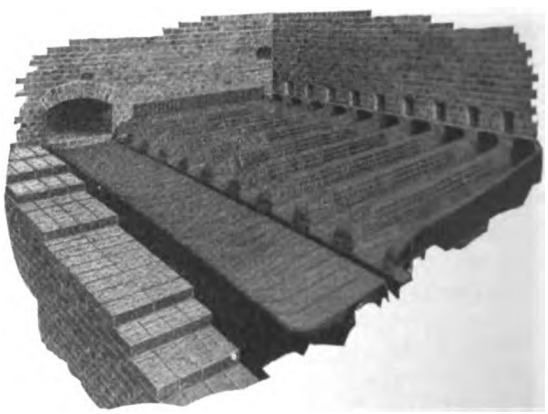
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WHY go to the trouble and expense of getting coal into your boiler furnace if you don't burn it up when you get it there?

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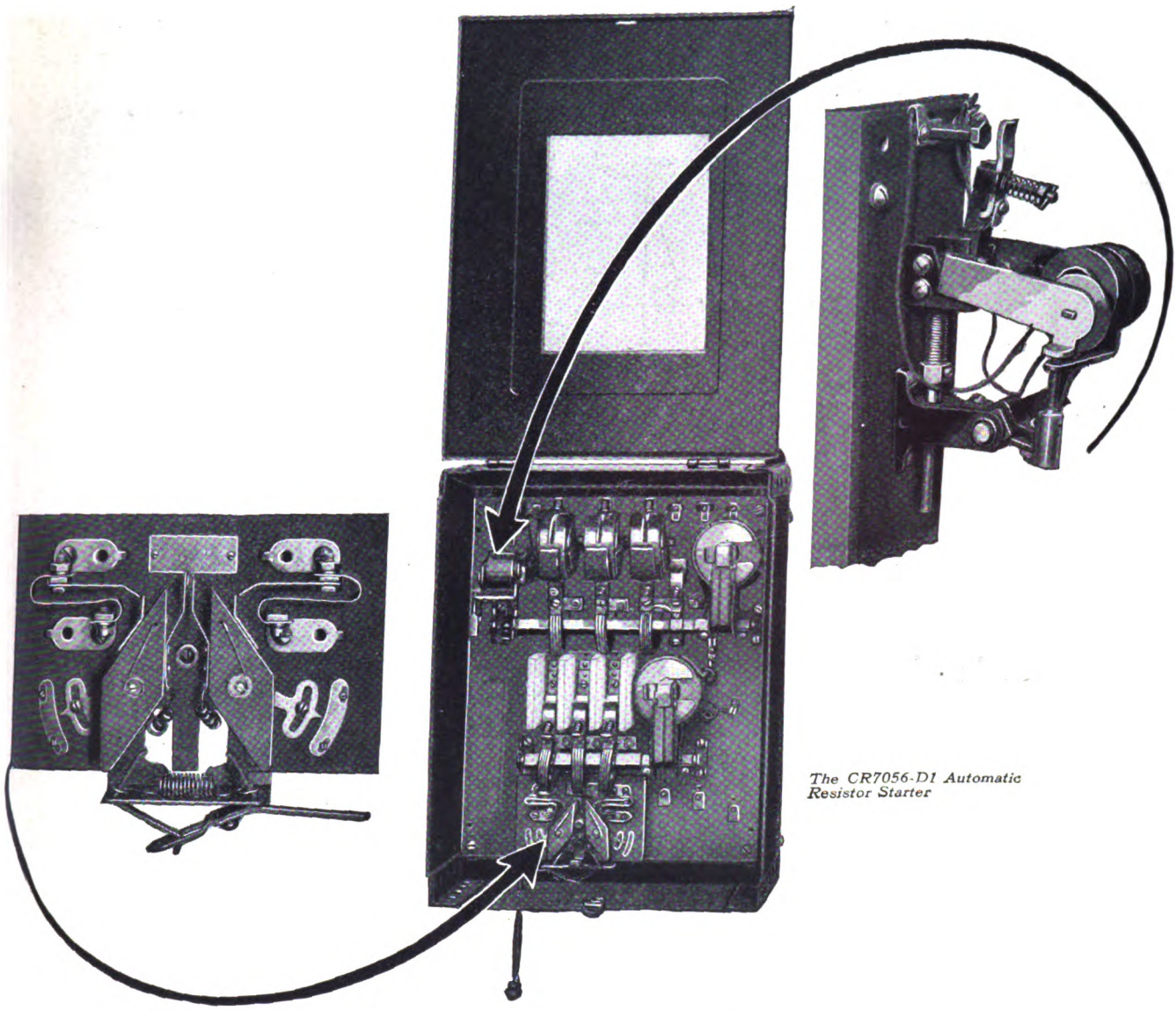
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The mechanical and electrical strength found in all G-E Starters is built into the CR7056-D1.

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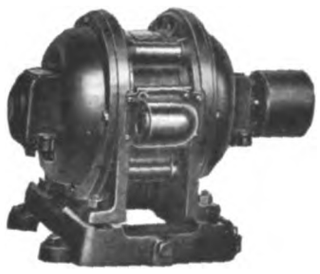
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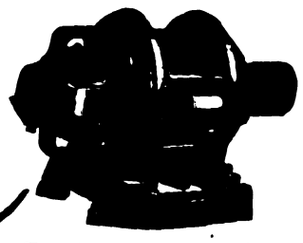
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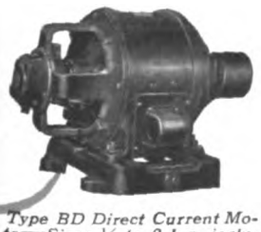
Four improved motors for general industrial uses.



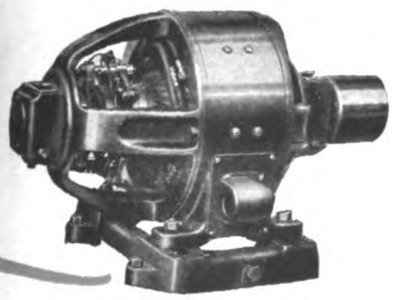
Type KT Polyphase Motor ("900 Series") Sizes ½ to 15 h.p. inclusive.



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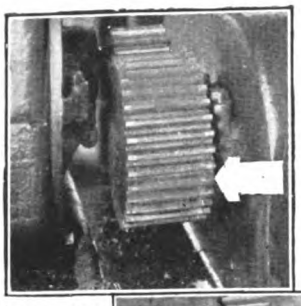
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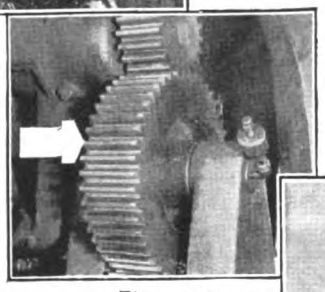
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The Fabroil Gears shown are still transmitting power silently and efficiently after four to ten years of severe service.



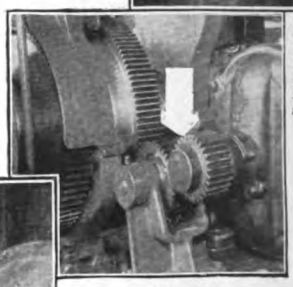
Seven years helping turn down shafts



Five years on a Pond Lathe, where cast iron lasted 7 months.

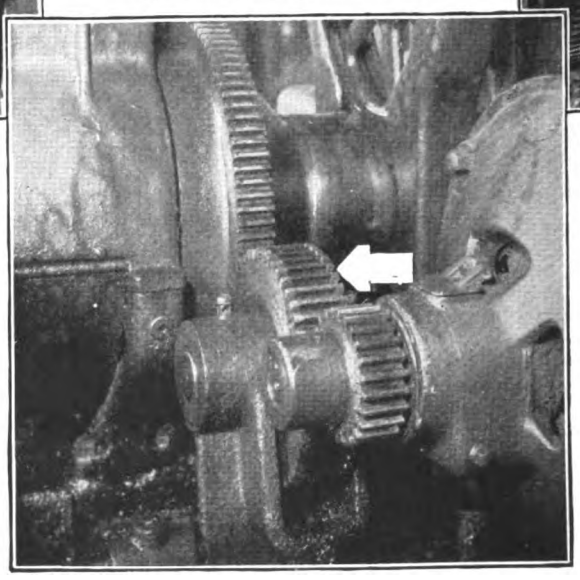


Four years where fiber lasted 4 months and rawhide 11 months.



Five years on a Gisholt Lathe, where rawhide lasted one year.

Ten years on a Gisholt Lathe, where rawhide failed after 9 months.



Years of Silent Service where others fail in months

Distributors for Non-Metallic Gears are.
Boston Gear Works, Norfolk Downs, Mass., with branches in Boston, New York, Cleveland, Chicago and Philadelphia.
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Cincinnati Gear Company, Cincinnati, Ohio.
Foote Gear Works, Chicago, Ill.
Wm. Ganschow Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, Ohio.
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Place a buffer or shock absorber on every machine you own by transmitting power to it through a silent, resilient G-E Non-Metallic Gear. The saving in wear on the machine as well as on companion gears will soon repay you.

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mental questions on V-thread cutting easily.)

Examiner: "How many degrees in the angle between two adjacent V-threads?" (Step 3.)

Applicant: "Forty-five." (Examiner keeps tally of the incorrect answer.)

Examiner: "How many threads per inch are there on the lead screw of most lathes?" (Step 3.)

Applicant: "Eight." (Examiner tallies the correct answer.) (The examiner proceeds with the remainder of his trade test questions on V-thread cutting.)

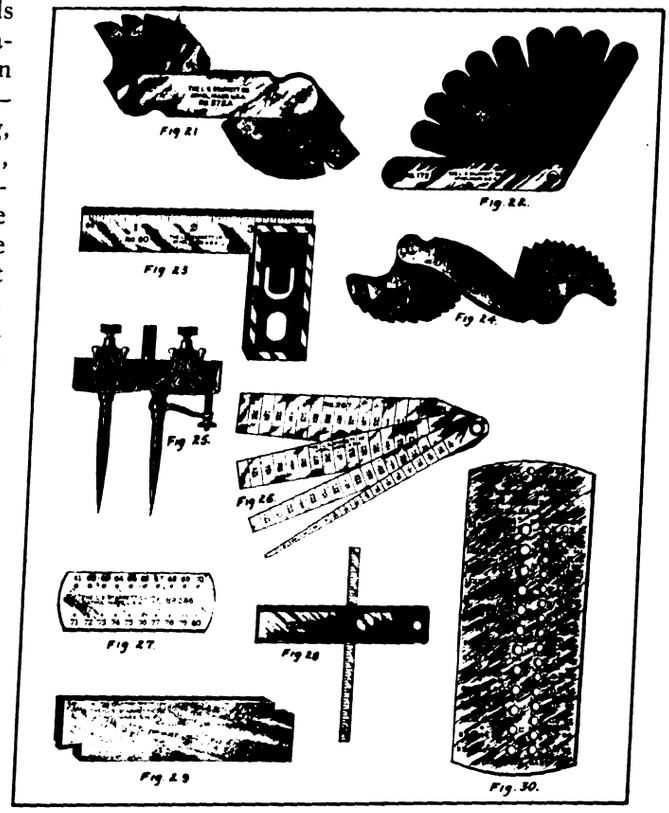
Examiner: "Have you ever cut Whitworth threads?" (Back to Step 2 again.)

Applicant: "No." (Note of the deficiency.)

Examiner: "Have you ever cut metric threads?" etc., etc. (Step 2.)

The examiner proceeds through all his list of analyzed operations which can be performed *on a lathe*:—eccentric work, turning, boring, drilling, filing, etc., etc., asking trade test questions to check up on those operations in which the applicant claims ability. It will be noted that the first classification is on the basis of the machine, the second of operations or products which can be turned out on that machine.

Having exhausted Steps 2 and 3 on lathes he proceeds to ask Steps 1, 2 and 3 if the applicant claims experience, on the milling machine, say. Then the procedure is repeated for planers, grinders and so on throughout the list.



A suggested illustrated sheet for testing knowledge of instruments.

The Preparation of the Materials for Such an Interview.

The necessary preliminary analysis of the trade has presumably been made in connection with the apprentice school. Not only are the essential facts for Steps 1 and 2 thus secured, but the trade tests required in Step 3 are also constructed soon thereafter. These trade questions may be as simple or as complex, as formal or as informal as desired. A large amount of time of the examiner can be saved by reducing some of the very common operations, occurring in a multitude of trades, to printed form. We present here two tests: (A) A test on the micrometer, and (B) a test on measuring devices generally. Such pictures as are needed may be had in abundance from any trade catalog. The number and excellence of the accompanying questions depends only upon the ingenuity of the examiner.

This is primarily a method of detecting the *specific weaknesses and strengths of the person tested.* The employee taking such an examination for promotion may be advised to study up on those operations in which he is weak; definite plans may be made to so arrange his work in the shop that he will get experience on those machines and those operations in which he is weak. A knowledge of one's weaknesses and strengths is essential to any well-laid plan for improvement.

For employment purposes, a modification of the above plan to suit the particular shop is desirable, since the intricacy of the plan would frequently prohibit its use because of the time cost. This time cost can be reduced to a minimum by the use of formal paper and pencil examinations of the type shown at the end of this article, since by this method any number of applicants can take the examination at the same time if a large enough number of the sets of pictures are available.

One can very readily secure cheaply a limited number of such pictures by the following process:

1. Paste catalog papers on white background and add necessary legends in black ink.

2. Photostat the above copy, obtaining a negative, in which the lights and shadows of the original will be reversed, just as on a photographer's plate.

3. When the negative is dry, run off on the photostat the required number of positive copies, reducing or enlarging to a desired uniform size, say 8½x11". (They should not be too small or graduations on micrometers, etc., will be difficult to read.) The lights and shadows now agree with the original copy; the lines of the original boundaries, where paper was trimmed from catalog, do not show. Two dozen of these positives may be had for less than half the cost of a zinc engraving alone.

4. Mount positives on fibre board and shellac all over with white shellac. The pictures may now be used hundreds of times. The necessary accompanying questions may be mimeographed.

The plan, or a modification of it to suit conditions, is essentially a plan for determining the weaknesses and strengths of the employee who is being periodically examined for promotion, or for the apprentice in training. Both have the promotion aspect; the employee should not be promoted to a position of greater responsibility until he has learned his present job; the apprentice should not be promoted to a harder task until he has learned the first.

In the public schools of the United States it is estimated that many millions of dollars are wasted annually in reteaching children what they already know. Pupils move about, are placed in grades where they are required to take with the class the same material which they already know; or they fail the grade, and the next year are compelled to take over again in the same grade the material (with the new people in the

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SAVE BOTH

THE BOLTLESS JOINT

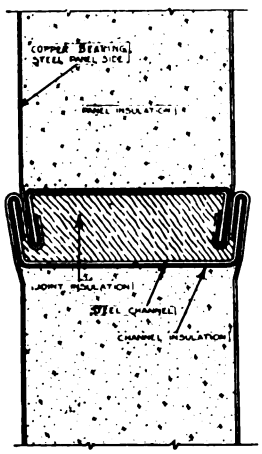
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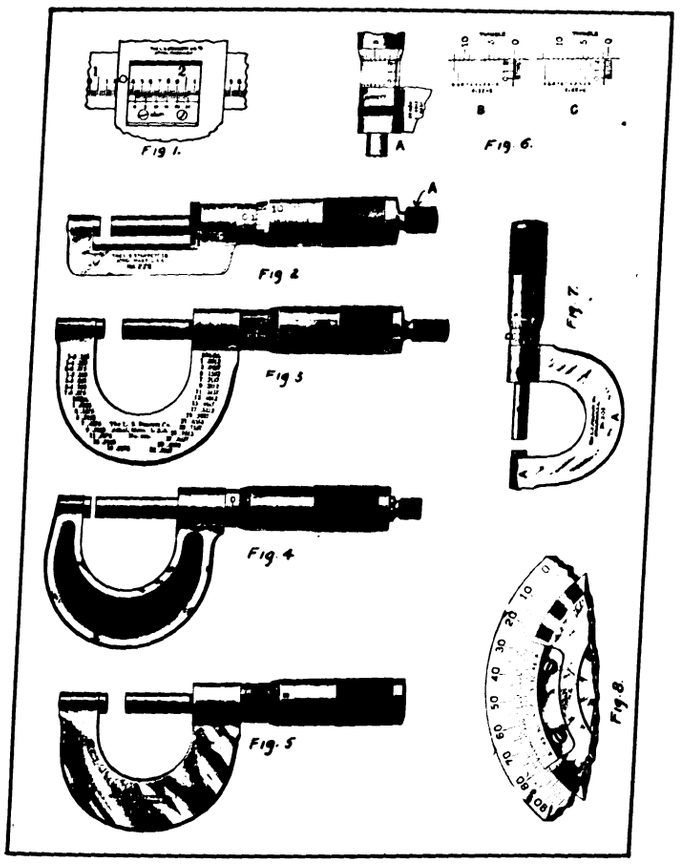
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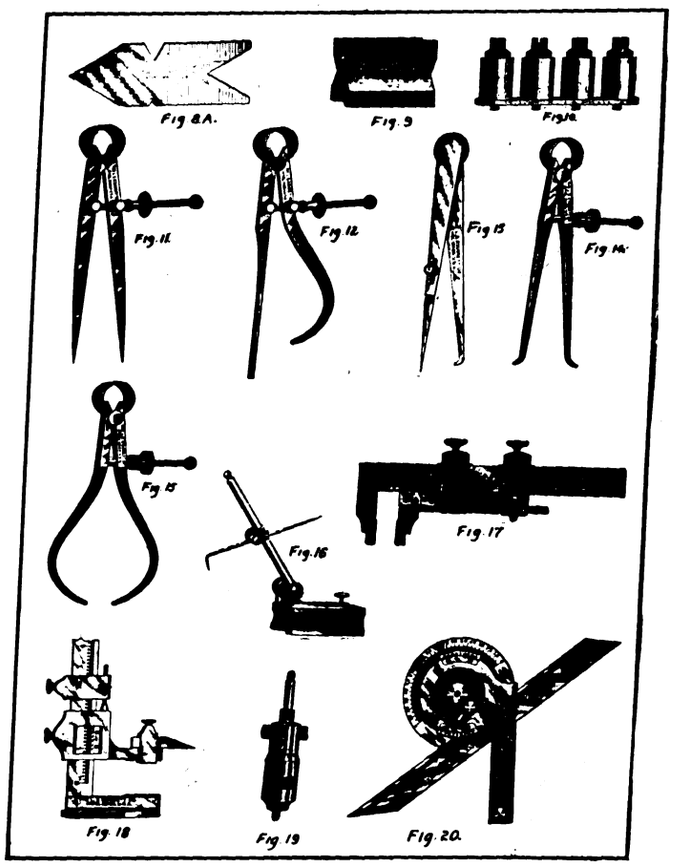
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grade) which they know; and, as a result, they lose interest in school work. Much public school shop teaching starts from this same "dead level" line, approved by tradition. Many students know more about a course before enrolling than others do after completing the course. An educational or trade inventory of the pupils' abilities would seem to be essential preliminary to the beginning of any course of economical shop instruction.



The practical skilled man discloses, by the extent of his familiarity with these details, far more than by referring merely to so many years' "experience."



The author explains in the text a cheap method of preparing these sheets. The same method is applicable to machine tools and operations.

A Typical Written Examination

Look at picture 1 and then answer questions 1 and 2 from it, by writing your answer on the line at the right. Then look at picture 2 and answer questions 3 and 4 and so on until you have answered all the questions you can.

Write your answers here

Picture 1.

1. What is the reading of that vernier? 1
2. What is the smallest fraction of an inch which that vernier will read? 2

Picture 2.

3. What does that micrometer read? 3
4. What is the attachment at A called? 4

Picture 3.

5. What does that micrometer read? 5
6. What decimal is 21/32 equal to? 6
7. What decimal is 9/16 equal to? 7

Picture 4.

8. Read that micrometer to the 1/10,000 part of an inch. 8

Picture 5.

9. What kind of a micrometer is that? 9
10. Read that micrometer in decimal parts of a centimetre. 10

Picture 6.

11. Read the micrometer at A to the 1/10,000 part of an inch. 11
12. Read the micrometer at C to the 1/10,000 part of an inch. 12

Picture 7.

13. What is the part at B called? 13
14. What is the part at C called? 14
15. What is the part at E called? 15
16. What is the reading of that micrometer? 16

Picture 8.

17. What is the smallest difference in an angle that that bevel protractor will measure accurately? 17
18. What is the reading of that bevel protractor to minutes? 18

Picture 8-A.

19. What do you call that tool? 19
20. What fractional part of an inch is the smallest division on the bottom scale of that gage? 20

Picture 9.

21. What do you call that tool? 21
22. What is that tool used for? 22

Picture 10.

23. What do you call the things in that picture? 23
24. On what kind of work are those used? 24

Picture 11.

25. What do you call that tool? 25

Picture 12.

26. What do you call that tool? 26

Picture 13.

27. What do you call that tool? 27

Picture 14.

28. What do you call that tool? 28
29. What do you call the nut on that caliper? 29

Picture 15.

30. What do you call that tool? 30

Picture 16.

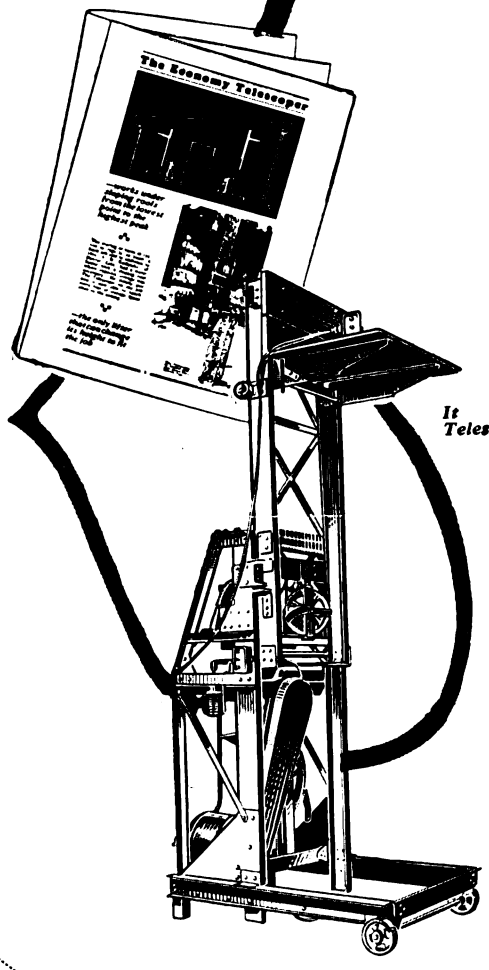
31. What do you call that tool? 31

Picture 17.

32. What do you call that tool? 32
33. What is the smallest fraction of an inch which that caliper will measure? 33

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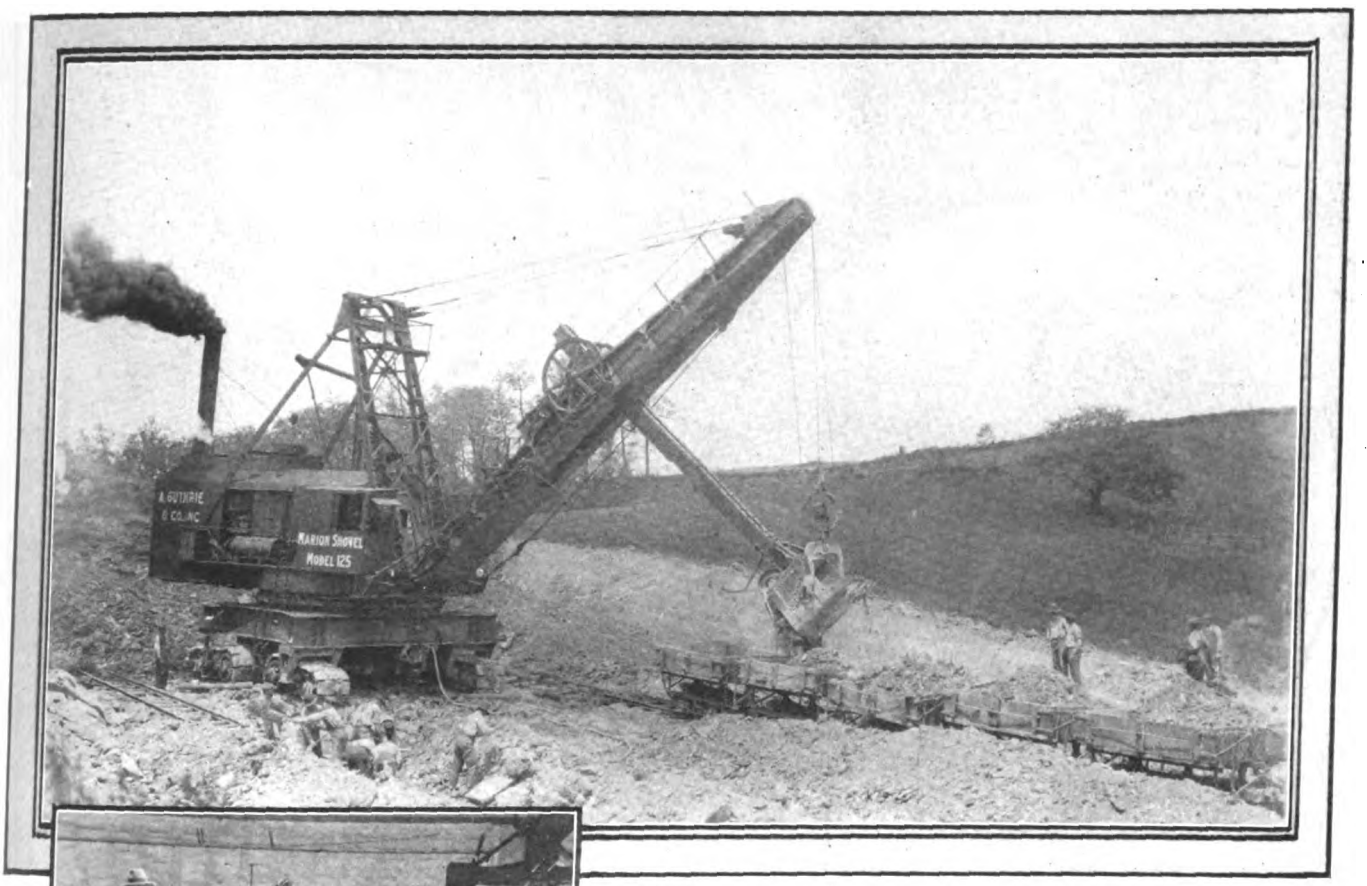
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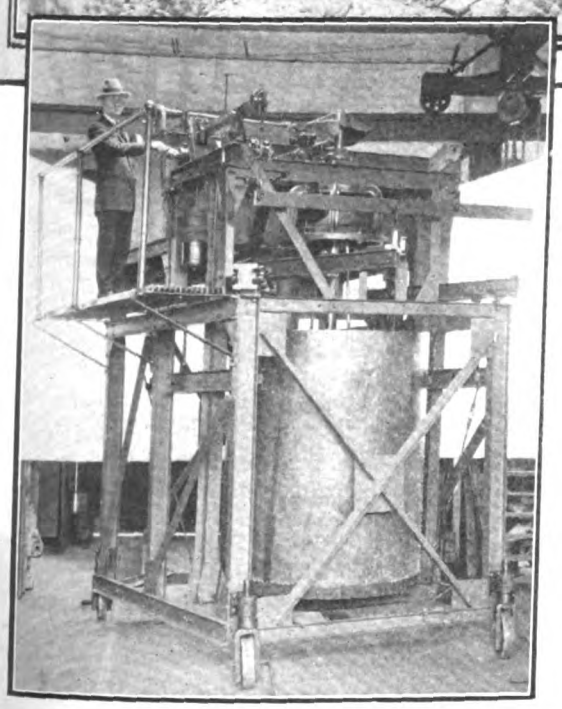
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Recent Developments in Materials Handling

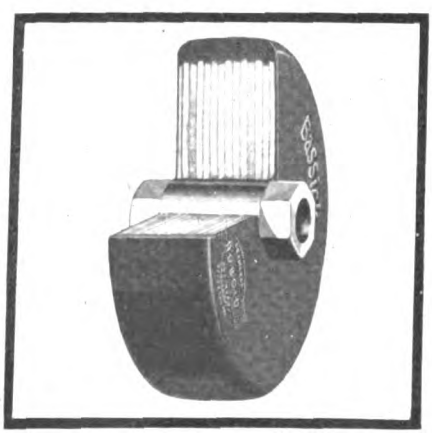
What Manufacturers Are Doing to Increase the Usefulness of Mechanical Equipment



The Marion Steam Shovel Co., of Marion, Ohio, have within the last year developed a new model, number 125, shown above. Several of these have been built and are at work in coal stripping, general contracting and open pit mining, such as stone quarries, iron ore and coal pits. This new shovel is full revolving, has large dipper capacity, is mounted on crawling traction trucks, and is designed for the hardest work and toughest digging. The manufacturers state that the strength, power, and speed incorporated in this model make its performance a revelation.



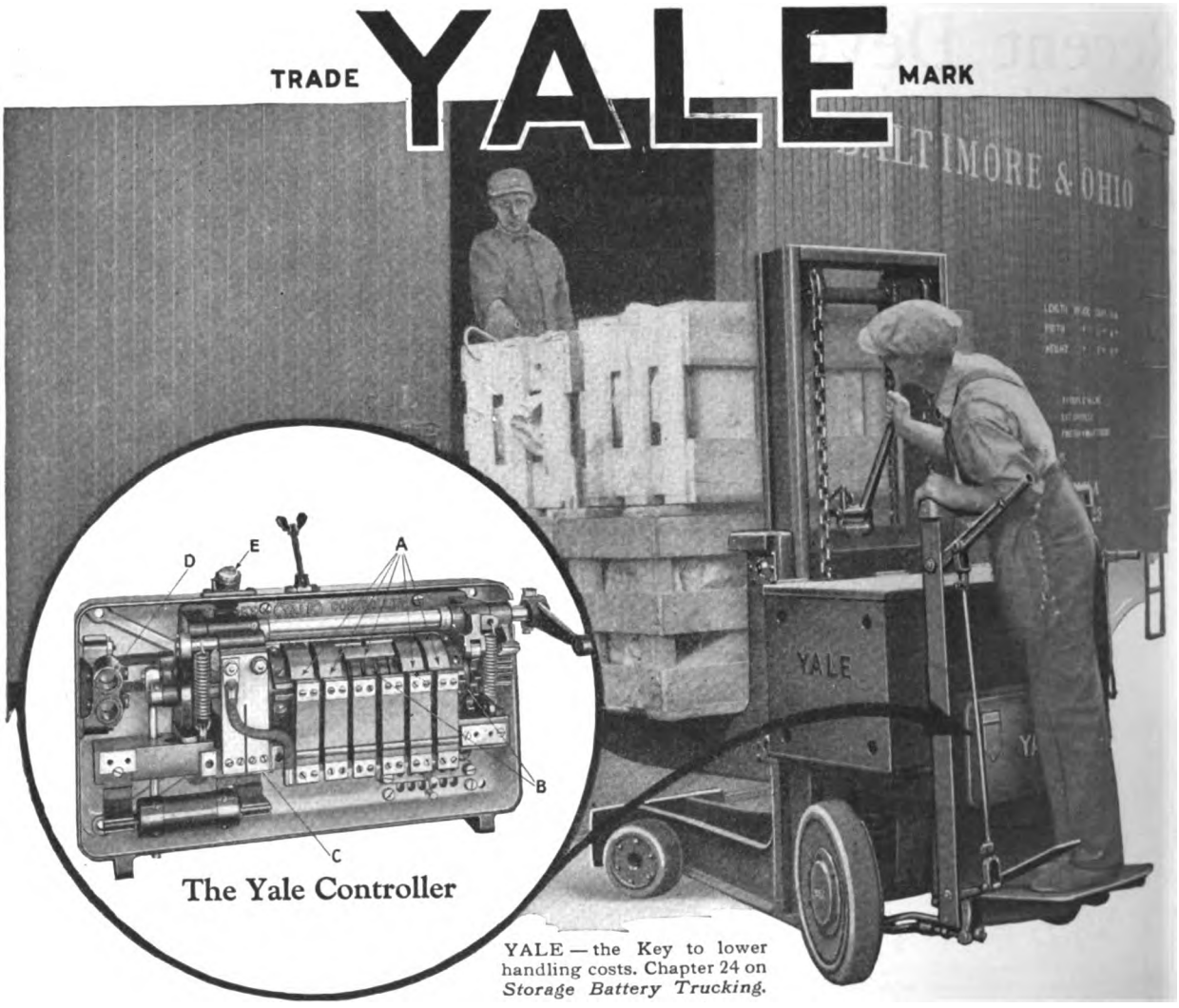
Richardson Scale Co., Passaic, N. J., have recently brought out the new Richardson Revolving Tank Automatic Juice Scale. This machine consists of a top hopper, a weighing tank inclined at 3 to 6° from perpendicular and the necessary operating levers. Material flows through it rapidly and there is no chance of weighing the same material twice.



Bassick Ruboid Truck Caster Wheel, made by the Bassick Co., of Bridgeport, Conn., and designed for strength with silent operation.

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The Yale Controller

YALE — the Key to lower handling costs. Chapter 24 on *Storage Battery Trucking.*

What should your truck investment be worth?

When you buy an industrial truck you contemplate that definite savings are going to be made in your material handling costs.

The amount of saving depends largely on the make and type of truck.

The question of whether the truck you select will deliver most in ton-miles, for the least cost, depends on the design and quality built into the machine. Take any part of a Yale Truck—the controller, for instance. Study the materials, design and workmanship.

A—the broad areas of pure electrolytic copper to eliminate overheating and destructive "sweating" at the contact points

B—the die formed Bakelite drum

C—the copper to carbon cutout to concentrate the arcing

D—the self-contained charging plug and receptacle

E—the Yale Pin-tumbler Lock to prevent unauthorized operation of truck.

Your examination will lead to one conclusion—that every part of a Yale Industrial Truck is built to give continuous and efficient service. Performance proves it.

Your investment value is secure with the purchase of Yale equipment.

YALE
Chain Blocks, Electric Hoists } For Lifts
I-Beam Trolleys, Industrial Trucks } For Shifts

Yale Material Handling Equipment includes Spur-Geared, Screw-Geared and Differential Chain Blocks, Electric Hoists, I-beam Trolleys, Overhead Crane Equipment, and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment—To acquire locking control, security and convenience throughout the factory, use Yale Master Keyed Locks.

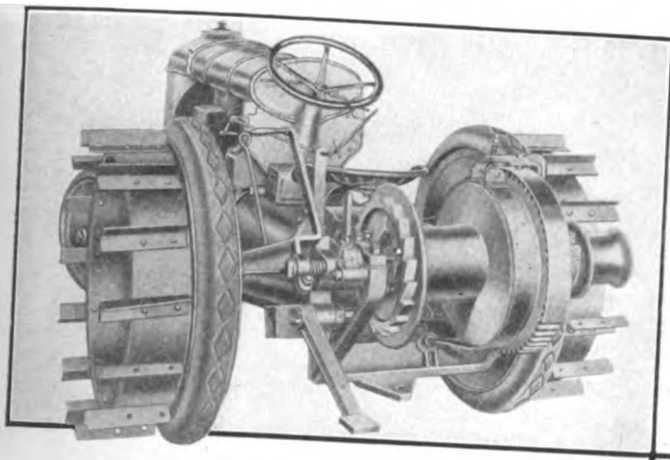
The Yale & Towne Manufacturing Co., Stamford, Conn., U.S.A.

YALE MARKED IS YALE MADE

YALE Hoisting and Conveying Systems

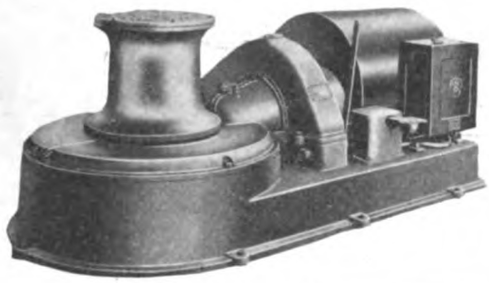
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At the left is shown one of the new style Clyde Hoist Attachments for Fordson tractors, made by the Clyde Iron Works, of Duluth, Minn. This improved model is built in three sizes and is equipped with a drum barrel capacity of 600 ft. of ½" cable. Immediately below it is shown the new Clyde Electric Capstan Car Puller made by the same company. These are built in three sizes, having line pulls of 3,000, 6,000 and 10,000 pounds at approximately 40 feet per minute.

Barber-Greene Company, of Aurora, Ill., have recently developed a new flight loader which is a new design in coal conveyors. This model, which is shown below, is a flight conveyor designed particularly for handling lump coal, and on this account is made self-propelling in order to make it easy to move about the coal yard or storage yard.

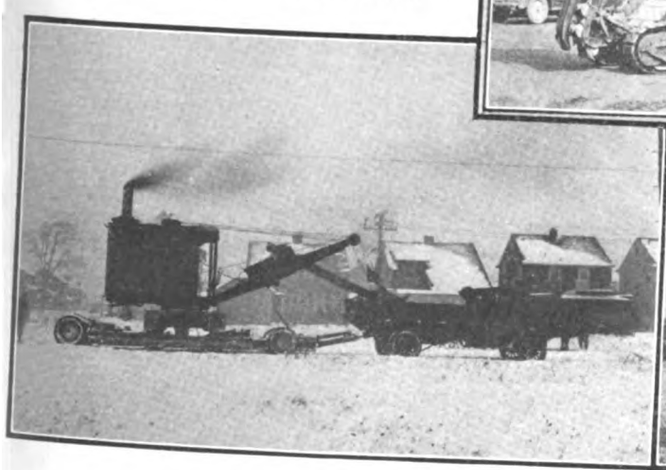


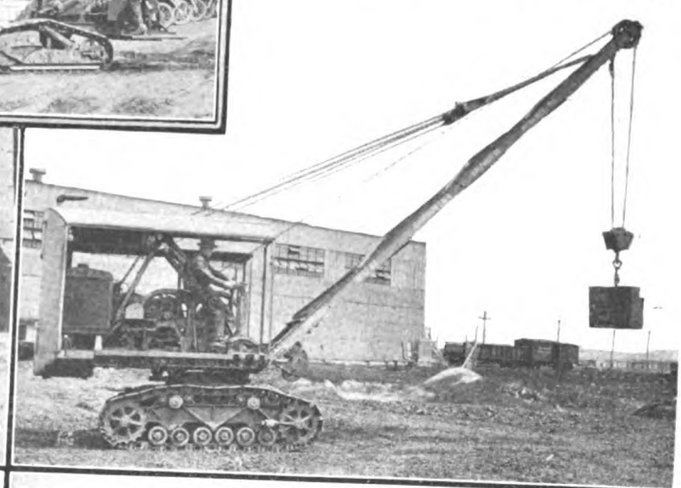


Another recent addition to the Barber-Greene line, shown at the right, is a 7 ft. ditcher; a machine which digs 18 or 21 inches wide, to a depth of 7 ft. This machine can be used for digging post holes, as the boom digs straight down. Mounted on full crawlers, it is mobile enough to be turned around on the top of a flat car. It is particularly recommended by the manufacturers for cutting service ditches from the house to the main trench in the middle of a street.



Harnischfeger Corporation, Milwaukee, Wis., has recently added to its line a ½ yd. full revolving gasoline or electric machine, mounted on corduroy traction, and known as Model 204. (Below).



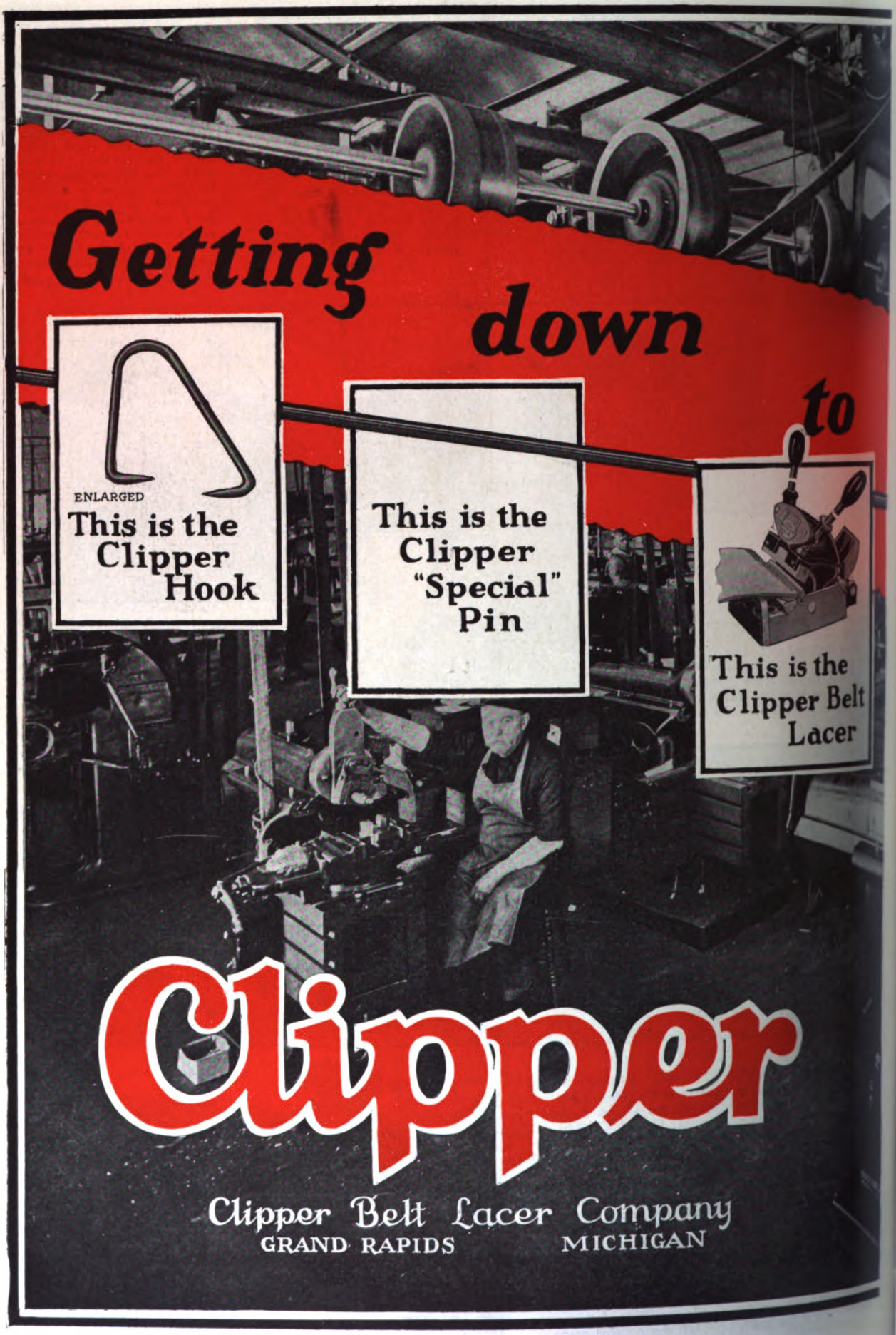


Above is shown an 8-wheel, 35 or 40 ton capacity trailer used for hauling caterpillar pavers and shovels. A new development of the Highway Trailer Company, of Edgerton, Wis., this trailer is equipped with four axles which pivot from the center and which hug the road, producing uniform pressure on each tire and wheel. This trailer was designed especially with a view to meeting the legal requirements as to allowable weight per axle and allowable weight per lineal inch of tire width.

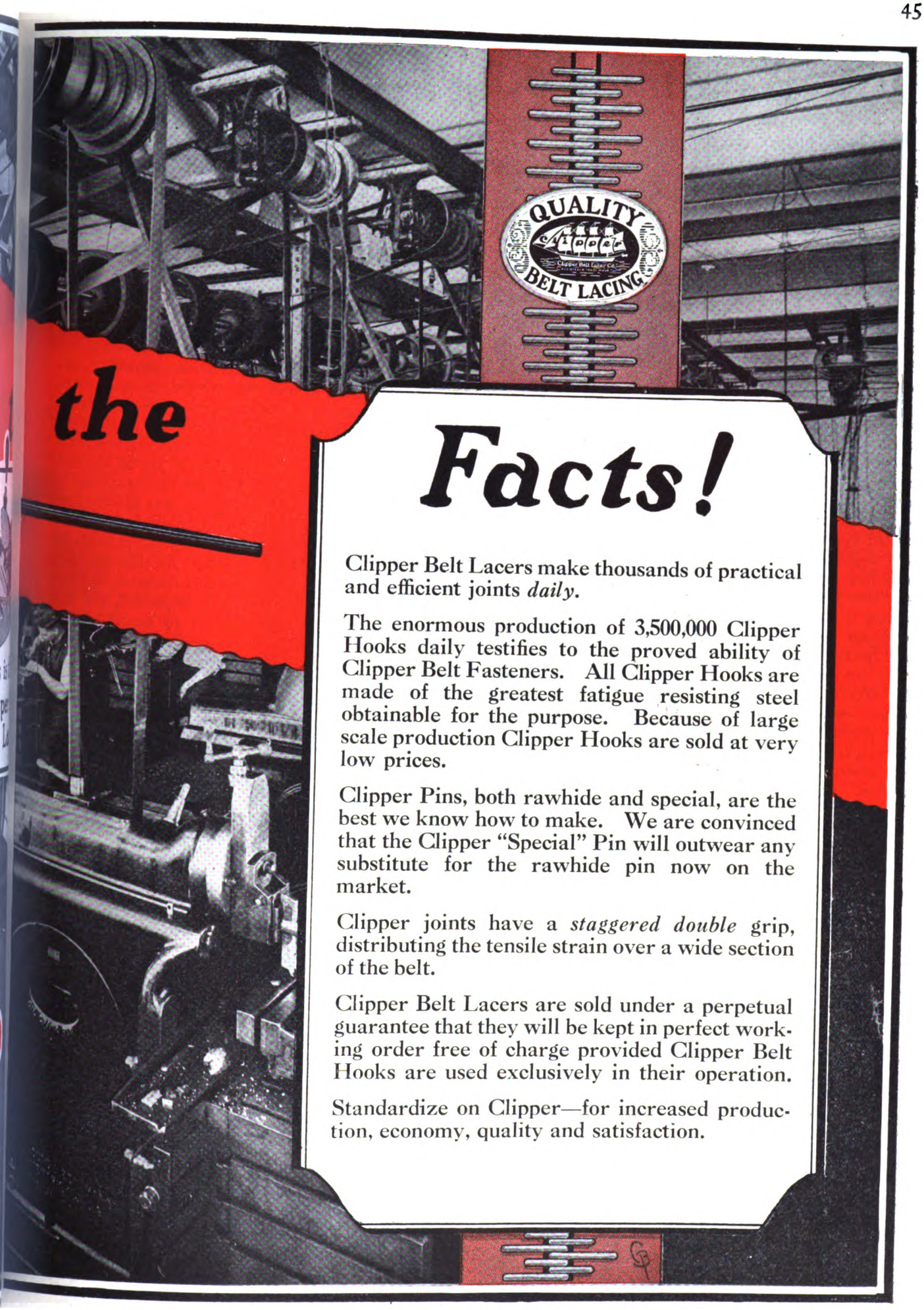
The new Ditcher Scoop, shown at the right, is a product of the Orton & Steinbrenner Co., of Chicago, Ill. This attachment has been recently brought out and the manufacturer states that it can be used on any crane or shovel of their make. They further point out that, whereas heretofore these attachments were put on machines that only swung in a half circle, their usefulness is materially increased by the fact that this model is made available for use on full circle swing crane.



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How Welding Reduces the Junk Pile

Making Better Joints in New Work, and Saving Broken Machines from the Scrap Heap

ANY measurement of the saving to industry, through the use of welding, must take into account the fact that frequently this is the only means by which an expensive piece of machinery could be repaired and put back into service. Again the welding of a broken part or machine may mean the prevention of a great loss in production, which might otherwise be involved to a given industry if it had been necessary to shut down a plant, even in part, to await the arrival of new equipment.

A repair job on iron or steel equipment is unlike many other kinds of repair undertakings, in that the work is not done merely to provide a make-shift pending the arrival of a new piece of equipment. Although a machine may have suffered serious damage, it has been repeatedly demonstrated that it could be so well repaired by an experienced welding operator that when ready for service it was in as good condition as the day it was newly purchased.

As an illustration of this take a machine in a certain plant at Cleveland. The illustration (Fig. 6) shows a large punch press, on which an extensive weld was made. The machine is as good as new, although relatively little expense was involved in its repair.

That welding, properly done, will stand the test of time and hard usage, has been proven countless times on a great variety of jobs. An instance which is typical is afforded in the case of a repair job made six years ago on a huge air compressor. The equipment had been broken in six places and was about set for the junk heap. Not only were the six pieces welded into a homogeneous unit, but the job was so well done that the compressor has been successfully operating day in and day out ever since.

The early inclination of many plant engineers and others, who held authority to determine procedure, was to stick to old methods and not give electric arc welding its full opportunity to demonstrate its worth. However, this inclination has now been overcome to a large extent.

Even after satisfactory electric arc welding equipment had been put on the market, the increased use of welding was greatly hampered by the lack of competent operators to do the work. As time has gone on this situation has been much improved, and it is logical to expect that as people come to realize more fully the possibilities of this method of joining metals, sufficient numbers of competent operators will be enlisted to eliminate the last stumbling block in the way of its general usage.

In the last analysis, given apparatus and materials, the success of a welded job rests with the operator. It is a case of satisfactory results not be-

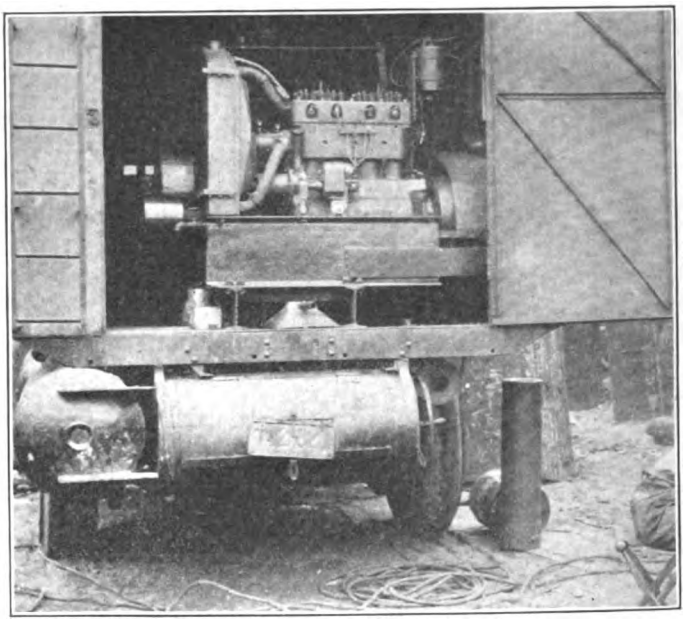


Fig. 1. Large motor truck portable welder ready to go to the scene of a breakdown.

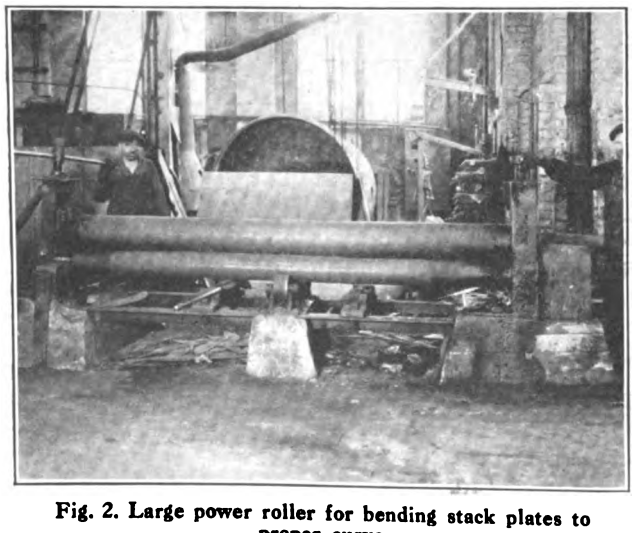


Fig. 2. Large power roller for bending stack plates to proper curve.



Fig. 3. Small hand power roll for bending small pieces of steel.

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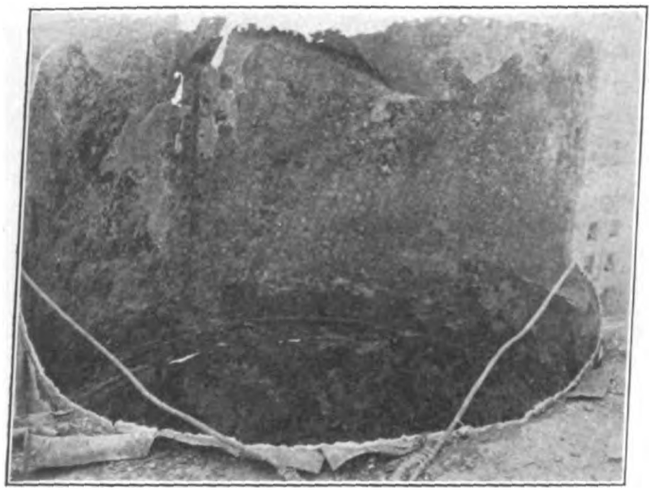


Fig. 4. Remains of top section of a Detroit stack, wrecked by rusting at rivets.

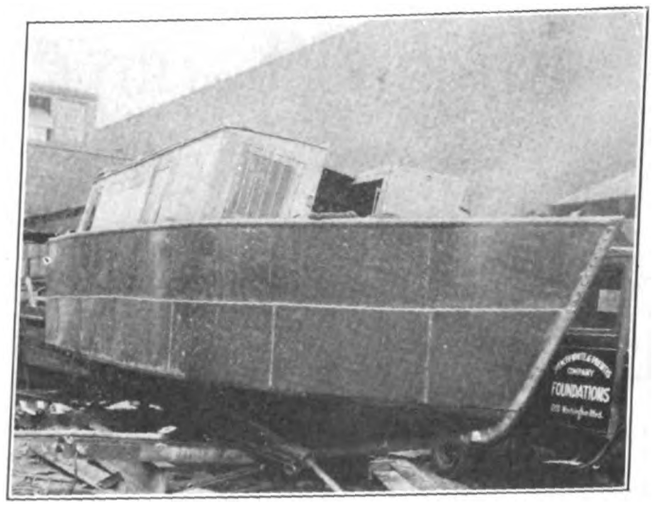


Fig. 5. New hull welded onto a marine portable welding outfit.

ing obtainable where either a poor machine and a good operator are used, or where a good machine and a poor operator are linked together. It is essential that both the two vital elements to a successful weld be of the highest caliber.

Welding is coming constantly into greater favor on new work where the joining of metals is involved. Take for instance the case of stacks for commercial or industrial buildings.

With the present day assurance possible of a one hundred per cent. welded stack job, it is logical that this method should be favored over that of riveting. To all intents and purposes it may be said that the actual first costs on a welded or a riveted stack are about even; the advantages offered by the welded production come in other directions.

Considering the efficiency of the joints in a stack, welded construction gives 100% as compared to 60% in the riveted type. Breachings and gas and smoke conductors in a stack generally allow air leakage when riveted, which spoils the vacuum, hence handicaps the draft. Of course when these parts of a stack are welded, the joint is 100% air tight. Joints of a stack that must be subjected to heat strains can be held tight when welded, whereas they will give if riveted. Cast iron can be held securely when welded into place but when riveted require, as a rule, machining to fit them up properly. One might mention practically every part of the construction of a stack to show how welding outdistances riveted construction.

Most factories burn soft coal, and when the collected soot from soft coal gets damp it forms sulphuric acid which eats into the stack. Soot tends to deposit on projections or rough parts of the inside of a stack such as rivet heads or seams of the riveted metal sections. A welded stack on the other hand has no rivet heads or rough edges, as the parts are welded both inside and out, leaving a smooth surface throughout. The base of a stack stays dry from the heat of the furnace but toward the top, acid forms and eats away the rivets, weakening the plates of the stack until, without warning, it falls.

In the modern buildings of today one may see instances of girders, joists and what not, where welding has replaced the rivet. In machinery plants the same condition is to be found—the rivet is going and the weld is taking its place. The time is not far distant when riveted construction will be in a class with other antiques.

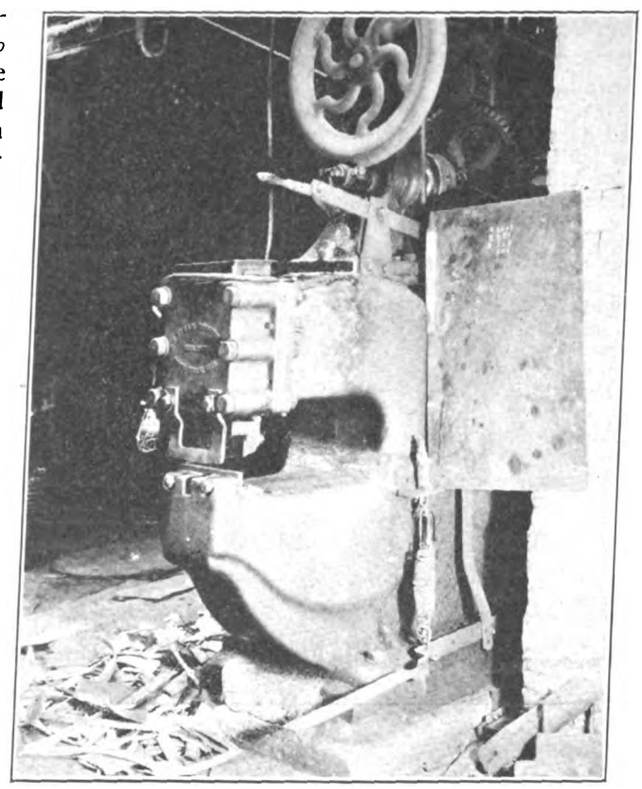
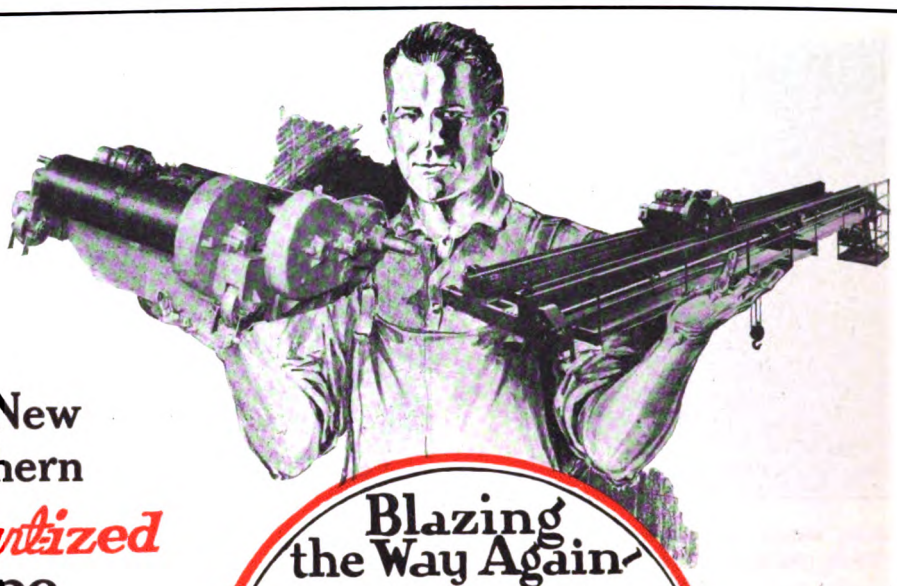


Fig. 6. A heavy punch press (see text) showing a weld through the arm that saved it from the junk heap.

The extent to which electric arc welding is being utilized successfully for repair work alone on all sorts of jobs, where either iron or steel is involved, is well illustrated by the volume of business done in a single year by a mid-Western company. Acting in the capacity of commercial welders, this firm with a total of twenty-eight machines did more than a quarter of a million dollars' worth of business in Ohio, Pennsylvania, Kentucky, Indiana, and Michigan during the last twelve months. Within this relatively short time these machines were turned to nearly every conceivable type of joining, repair or rebuilding. The jobs ranged all the way from the building of great stacks to the repair of marine boilers, engines, hulls, etc. And the saving resulting from this work is probably well over the million dollar mark.

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Sectional view, Fig. 370, Jenkins Standard Bronze Gate Valve.

The Jenkins "Diamond" is an unfailing indication of a valve that does its job, and does it well. The extra sturdiness built into each assures the user of reliable performance in severe as well as average service.

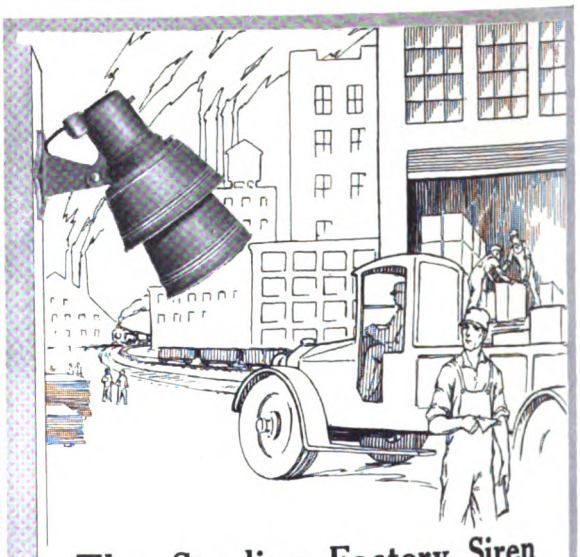
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Labor Policies That Plan for Tomorrow

By Russell J. Waldo

ACCORDING to the estimate given by the United States Department of Labor, there are approximately 2,000,000 who are constantly changing from one job to another, never being satisfied but forever moving about. This is a surprising figure, yet the majority of these if given the task in which they possessed the greatest interest would be retained.

One need only enter any organization and note those entirely unfitted for their tasks, those who lack interest, and those who do just enough to get paid to realize the huge waste in industry and to realize the real need of some organization to assist the worker to find the work he likes best and is best able to do.

The plan worked out in conference between the employees of the General Electric Company, Lynn, Mass., and the company, with a member of the National War Labor Board acting as administrator, has accomplished more by way of friendly cooperation than any other like method of procedure. This is one of more than a dozen similar plants of the same company about the United States and at Lynn the total employees are from ten to twelve thousand.

At the Lynn plant there are the major trades including skilled machine work, carpentry and other common trades as well as classes of work special in this type of plant. The employee's representatives of each section constitute a committee on fair dealing to cooperate with the management in fostering just and harmonious relations between the management and the employees. Any matter requiring adjustment may in the first instance be referred by the employee affected either personally or with one or both of the representatives of his section, to the foreman of the work on which the employee is engaged. If the foreman fails to adjust satisfactorily any matter referred to him, it shall then be reduced to writing and taken up by the joint shop committees.

Similar plans have been worked out by the Colorado Fuel and Iron Company, the International Harvester Company, Bethlehem Steel Company and scores of other representative companies.



Fig. 1. A completely equipped Hygiene Department is maintained by the National Cash Register Company. Two doctors, two dentists, three nurses and a visiting nurse help employees to keep well.

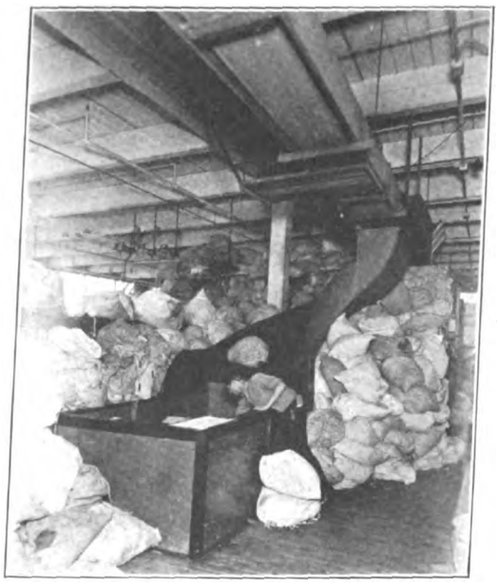


Fig. 2. Labor saving devices and good working conditions are a potent aid in building a loyal working organization.

This method of retaining the employee's good will has done more to foster pleasant relations between the employer and the employee than any other plan that has been put into action.

Other notable projects have been organized at the Westinghouse Air Brake Company at Wilmerding, Pa. Here are employees' homes, dining rooms, clubs, and other community betterments. Within the plant are to be found organizations of safety and for athletics, compensation funds have been established, and the hospital and other similar activities have encouraged the employees of the Westinghouse Air Brake Company to remain with the company which treats them well.

Then there are such companies as the American Rolling Mill Co. at Middletown, Ohio, with their broad policies for employee betterment, both mentally and physically, which has reduced the labor turnover at that plant considerably.

The Studebaker Corporation at South Bend, through their housing project, cafeteria, and athletics, have done more than would be believed to interweave a spirit of cooperation between the workers and the management.

The day nursery and kindergarten at Clinton, Mass., organized

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by the Lancaster Mills, the coöperative dairy owned by the Pacific Mills, Columbia, S. C., have each had a notable effect upon the morale of the workers about the plant.

The Mutual Benefit Associations of the International Harvester Company, Chicago; Westinghouse Electric and Manufacturing Co., Philadelphia Electric Co., Cheney Brothers, South Manchester, Conn.; Bethlehem Steel Co. and a score of others, while they vary in actual methods of procedure yet in the ultimate result they have woven into the employees a network of co-operation which talking would not have accomplished.

There are some most interesting figures found in the 1924 report for the Federal Board of Vocational Education. In 1924 there were 16,192 teachers of both sexes in vocational courses. There were under those teachers 652,994 pupils, in the United States. There were in the same year 140 schools federally aided instructing vocational teachers.

The total state and federal (also local) money required to operate these schools was $5,064,655.52. The leaders of industry can feel very much encouraged by the results being made possible through these schools. These students come out and are absorbed by industry very quickly and in the minimum of time they are skilled workers.

The Mergenthaler Linotype Company, even in Brooklyn, N. Y., have found it highly profitable to erect homes for their workers. The American Woolen Company have erected homes strictly modern for their workers. A list of scores of company housing plans could be given yet they all have accomplished the same result. They have brought the company's workers closer to the company and the spirit of coöperation which results retains the workers more satisfactorily than any method which could be conceived.



Fig. 3. Typical housing project of the Bristol Brass Co. Note the variety of houses erected. This does not give the appearance of company housing.



Fig. 4. At the left is a view of the training room for tool maker apprentices, at the Lynn Works of the General Electric Co.

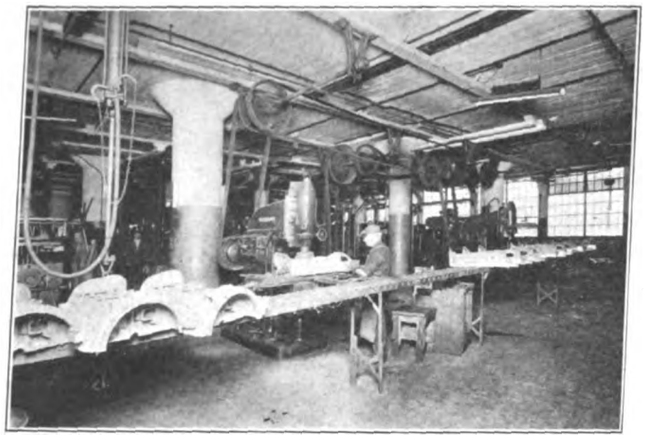


Fig. 5. At the right—another illustration of mechanical equipment that improves the working conditions.

In every industry we find the entrance of women. They have entered in enormous numbers. They have proved themselves to be good workers, highly efficient and in many cases superior to men. The women have then brought themselves to be considered as an important factor in modern industry.

Everywhere one goes there is much readjustment necessary before business can expect to be normal. Workers for the past two years have not been laying aside any money. There are many needs which must be satisfied quickly before makers of luxuries can expect the workers as a class to increase their production figures.

It is the workers who swell the demand for products of our larger industries in general. Those out of employment or barely earning a livelihood do not contribute to the demand, and thereby increase the volume of business as they do when working steadily at substantial wages. The reduction in wages and time at work affects the employer as much as it does the employee.

The leading employers have given very careful attention to the needs of their workers and have won them over for long time satisfied workers, giving those employers little or no reason to have fears of a coming labor shortage.

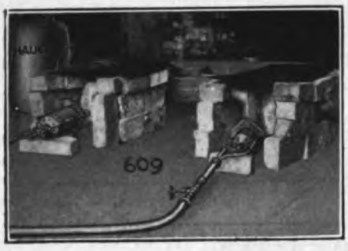


Fig. 6. The Grocery Department of the company store, Packard Motor Car Co., Detroit.

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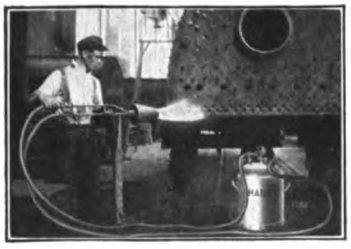
For PREHEATING in connection with welding use Hauck Kerosene Torches, and reduce the fuel cost by 50%. The steady, mild heat insures perfect welds.



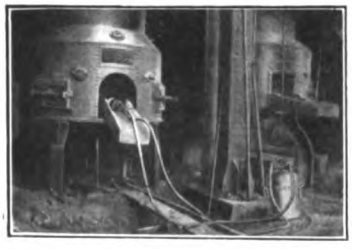
In PIPE SHOPS—Hauck Kerosene or fuel oil torches are used for pipe bending, flanging and shaping, annealing copper pipes, brazing cup joints, etc., and save time, labor and fuel.



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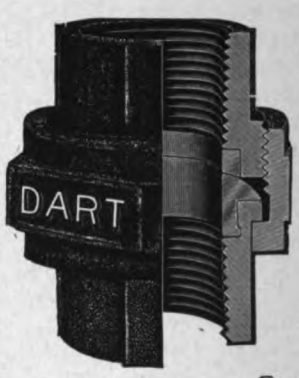
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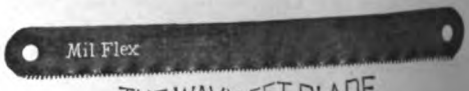
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Keeping the "Chaff" from the "Wheat"

The Use of Separator Magnets

By L. S. Monroe

The Electric Controller & Mfg. Co., Cleveland, Ohio

A TINY piece of steel among the grain which is being ground to make feed, has been known to strike the spark that wrecked a grain elevator. Minute particles of iron in the batch which is to be melted to make high grade plate glass, colors that glass green instead of leaving it the desired clear white and also causes bubbles to form in the glass, thus making the product worthless. A piece of drill steel from the limestone quarry may be among the clinker which goes to the grinder in the cement mill and a broken down machine will be the result. A bolt may fall from the slab slasher in a saw mill and go with the waste timber to the hog which chews up that waste for fuel, with the result that a blade in the hog is broken and the fuel system is tied up. As ore comes from the mine, it may contain a broken tool which, if not taken out, gets into the crusher and breaks a roll.

These are not only possibilities but typical examples of just what does happen far too frequently in industries similar to these. Small wonder, then, that so much attention is given in plants where hazards of this kind exist, to the magnetic removal of iron and steel from among their raw materials and products in process.



Fig. 1. Looking into the chute (in a glass plant) down which cullet goes to the mixer. A rectangular magnet for extracting tramp iron. This chute has a 45° slope so that the cullet moves quite rapidly past the magnet.

There are different ways of placing separator magnets with regard to the materials they are working on, but the character of these materials should dictate which arrangement is the best for any particular job. The depth of the stream and the speed at which it is traveling must be taken into account when deciding where the magnet is to be placed and also what type and strength of magnet is to be used. A few examples of how different industries are using separator magnets are given here.

Does it seem strange that at a large manufacturing plant where first quality plate glass is made, one of the tools of the man who inspects the sand on delivery and before it is accepted, is a small bar magnet? This he runs back and forth through samples taken from different parts of the car of sand and if it collects too many particles

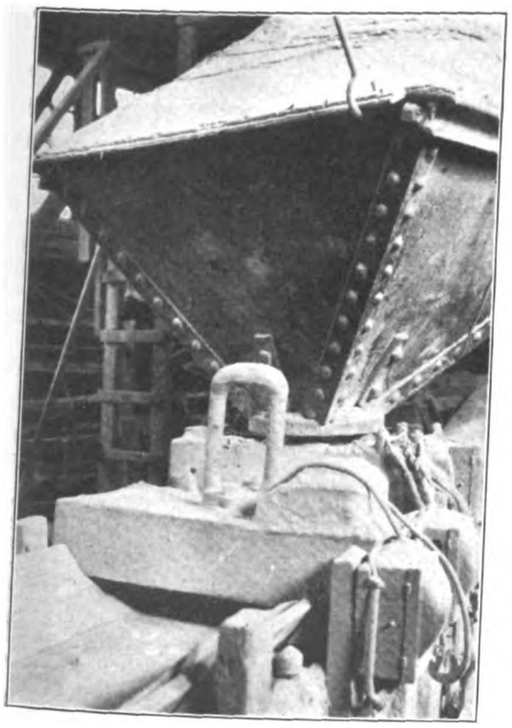


Fig. 2. At the left — A rectangular separator magnet above a belt conveyor in a plate glass plant.



Fig. 3. At the right— Same as Fig. 2, but trough is carrying a batch to the storage bins.

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of iron, that sand is rejected. This same care is used throughout the plant to see that any iron which may get into the materials in process is removed before the batch is sent to the furnaces. As the cullet, or broken glass for remelting, slides down an inclined chute to the mixer, it passes under a rectangular magnet for removing any iron from it. Later, as the mixture of cullet and new raw materials is carried to the hopper from which the charging machine draws its supply, the batch passes under a second magnet for this same purpose. Only by such precautions as these is the glass manufacturer able to produce clear, white glass.

Among the manufacturers of cement and limestone products, the popular method of using a separator magnet is to suspend it directly above the belt conveyor on which the products in process are carried. As the crushed limestone, coal cinders, clinkers, etc., are fairly light and uniform in size, these belt conveyors can be loaded in a thin layer. Large quantities are moved, as conveyors so loaded can be speeded up considerably without decreasing the effectiveness of the separator magnets. Several times a day, when the belts are shut down, these magnets are swung out of the way and the tramp iron is cleaned off of them. It is surprising what is collected in a short time — everything from suspender buttons to rock drills.

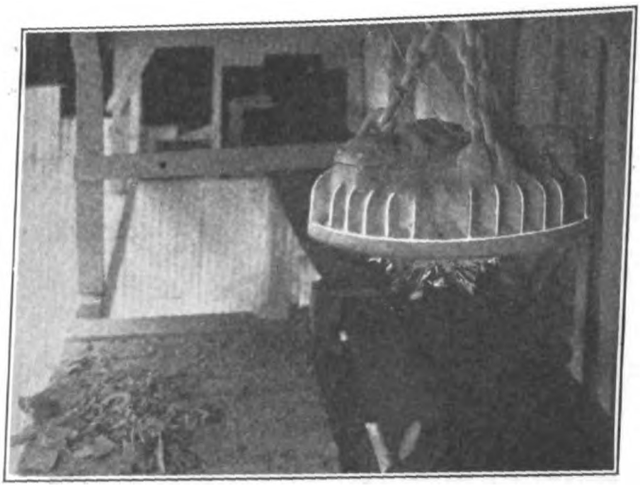


Fig. 4. Circular magnet suspended above a rapidly moving conveyor belt which carries cinders in a cement mill. A day's accumulation of scrap iron is seen at the left of the magnet on the platform.

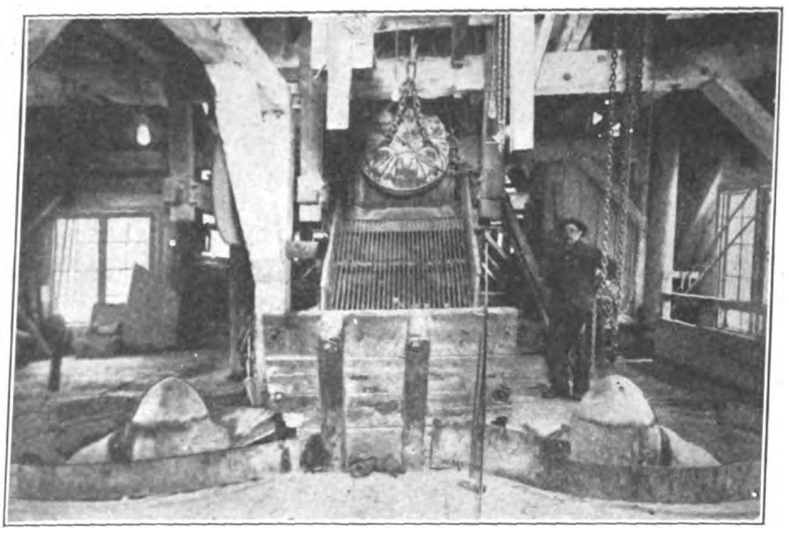


Fig. 5. Circular magnet with angle suspension above head pulley on ore belt conveyor. Ore going to the gyratory crushers. (In a lead-silver refinery.)

At some plants where direct current is not available on the power line for use as magnetizing current, small motor-generators sets each capable of supplying just enough current for one magnet, are installed right next to the separator installations. Throwing the A. C. switch to start one of these motor-generator sets energizes that magnet. This type of installation has the distinct advantage that no long direct current power lines need be run from the power plant to those very out-of-the-way spots in which separator magnets are so often installed.

Comparatively few companies use separator magnets for extracting iron from wet materials, the reason being that such masses are so much more compact and binding on any metal which may be contained in them. However, one type of installation for extracting tramp iron from wet ore has proven very satisfactory. The magnet is placed upside down so that its face is a part of the bottom of a trough through which wet ore is washed by a continuous stream of water. It is quite evident that for service such as this, where water is flowing across the face of the magnet, this magnet must be absolutely water tight and impregnated against moisture.

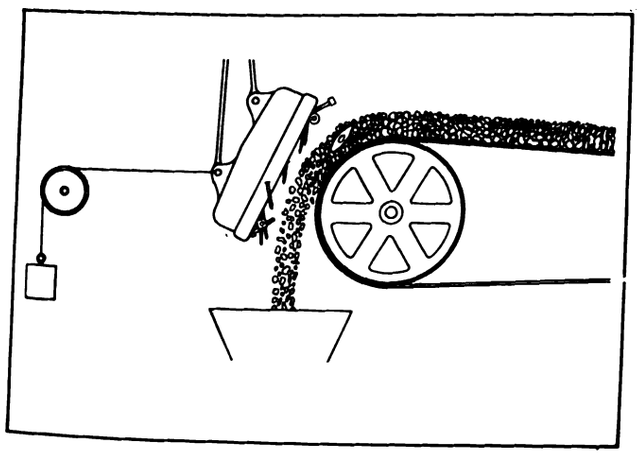
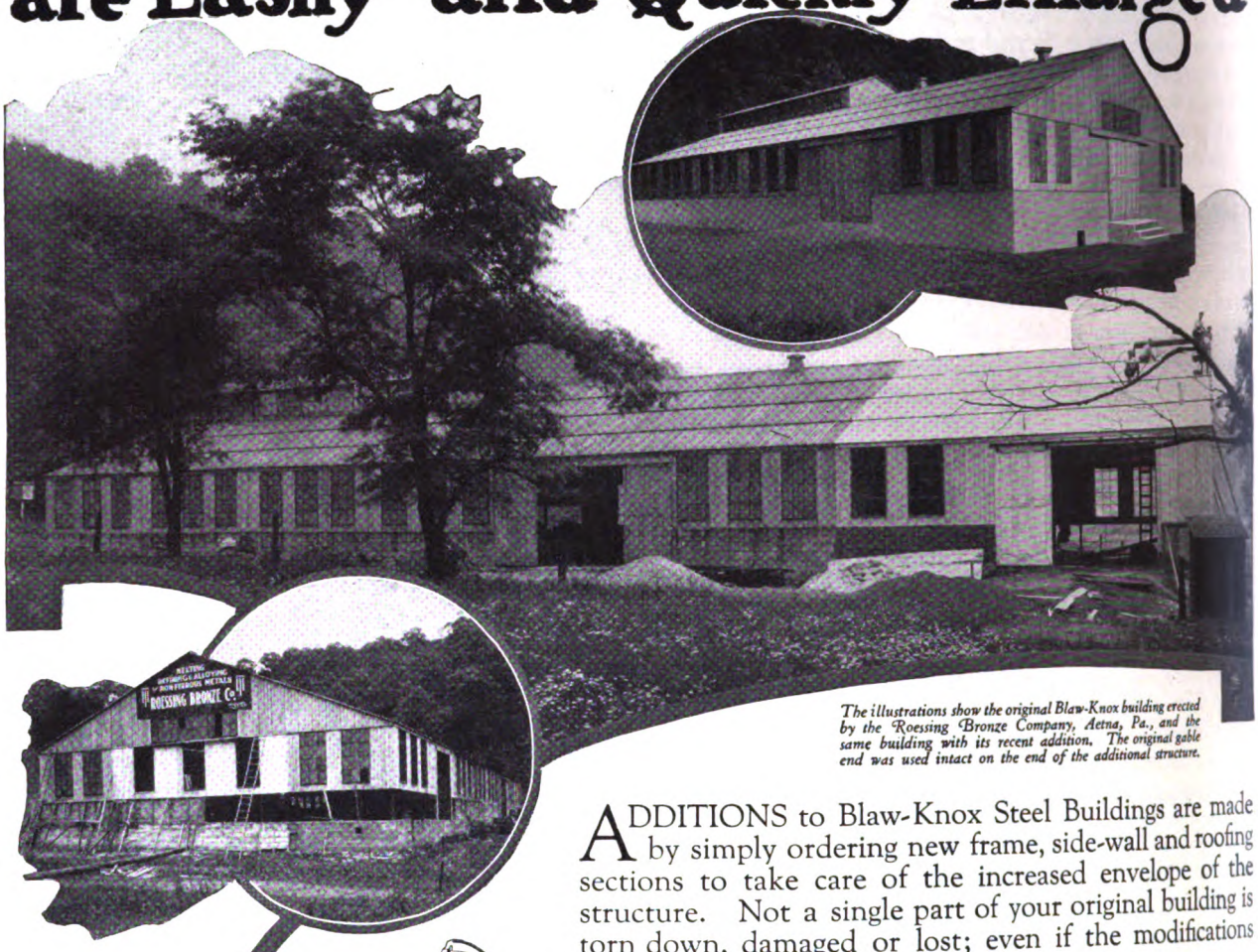


Fig. 6. Sketch showing the placing of a separator magnet at an angle at the end of a belt conveyor.

One company that uses a large number of separator magnets has run extensive tests to determine what type is best suited to this kind of work. Their results showed that bi-polar magnets had too much leakage at the top and sides. Magnetic pulleys were not entirely satisfactory and water cooling was found to be unnecessary. The round, air cooled "mushroom type" was proven most satisfactory because of the fact that the magnetic flux is concentrated at the bottom of the magnet. This same concern reports that they have reclaimed three twelve-yard carloads of tramp iron in six days. Their conveyor belts run at 385 feet a minute, at which speed

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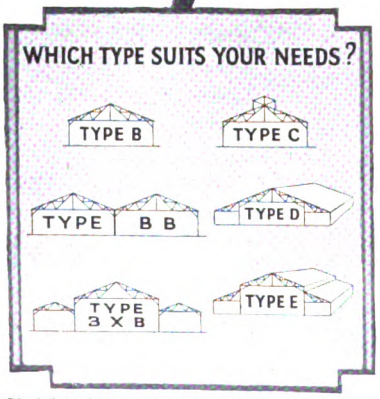
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Fig. 7. Circular magnet suspended from the rear of a five ton truck for clearing the roads of puncture causing material.

the conveyors handle 350 tons of material per hour.

In the Coeur d'Alene mining district of Idaho, a standard method of placing separator magnets has been almost universally adopted. This scheme consists of suspending the magnet at an angle over the head pulley where the ore stream is just leaving the conveyor belt. At this point the belt has changed from a troughed to a flat condition and the material is more spread out. Then, too, just as it starts to fall from the belt it is loosened and broken apart, thus tending to free any pieces of iron which may have been lodged under lumps of ore. Being at an angle, the face of the magnet is tangent to the path of the ore as it falls and so presents its greatest working area to the ore stream. A large mining and concentrating company who are using quite a number of magnets for this purpose in both their mine and smelter plants, state that this arrangement of placing the magnet at an angle above the end of the ore stream produces by far the best results.

This angle suspension is not rigid, for the magnet is left free to swing away if an unusually large lump of ore lodges between it and the belt. It will at once return to its original position after this piece has been dislodged. To get the maximum results with this scheme the head pulley should be of wood, brass or another non-magnetic material to prevent diversion of the magnetic flux. Magnets used for service like this should be protected with a manganese bottom plate so as to withstand the wear from the impact of the ore or other materials on the bottom of the magnet.

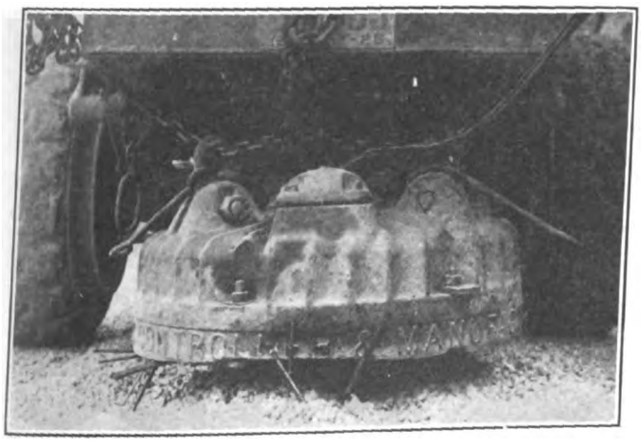


Fig. 8. Close-up of magnet shown on the truck in Fig. 7.



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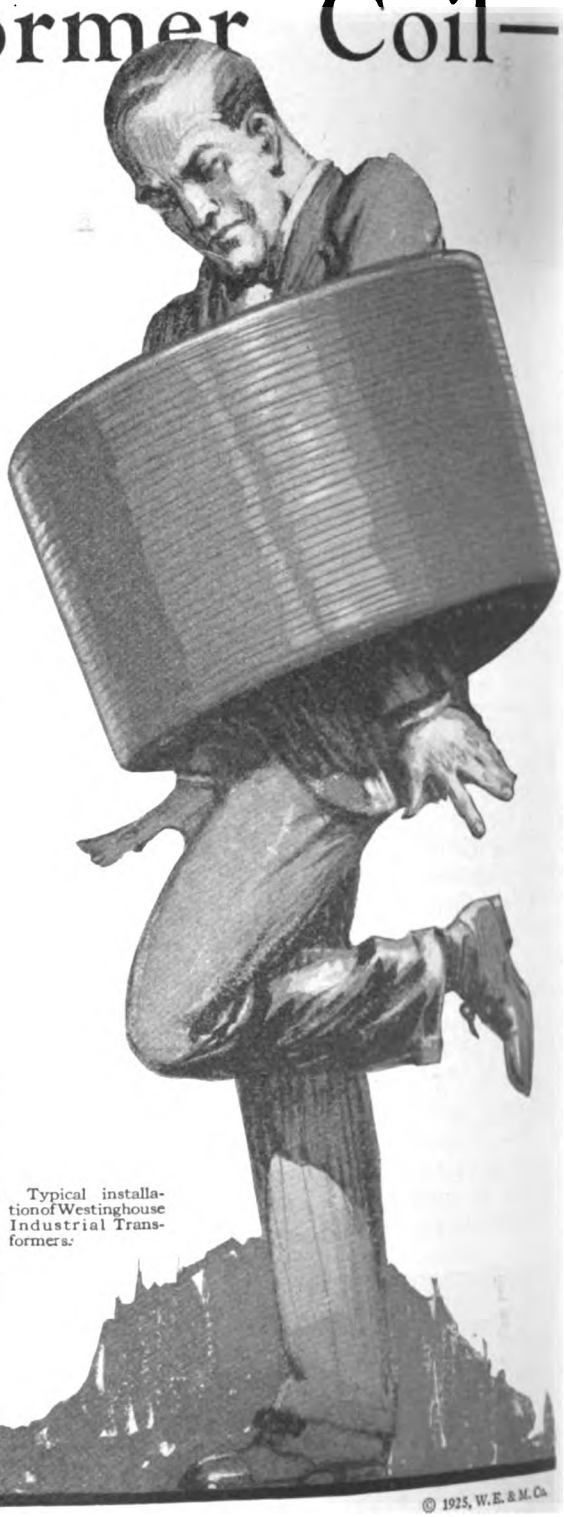
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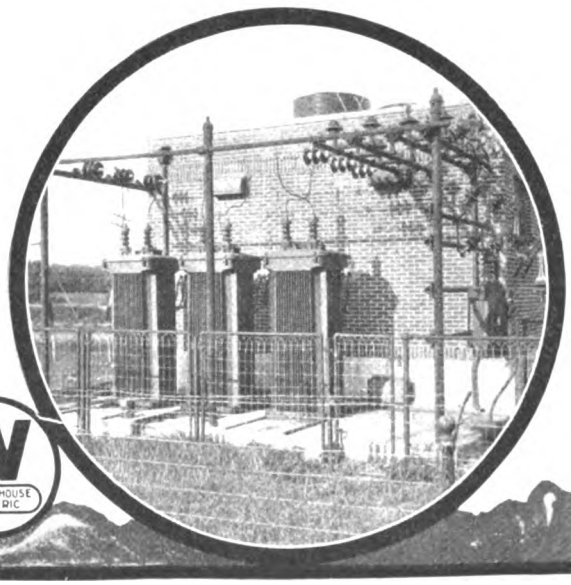


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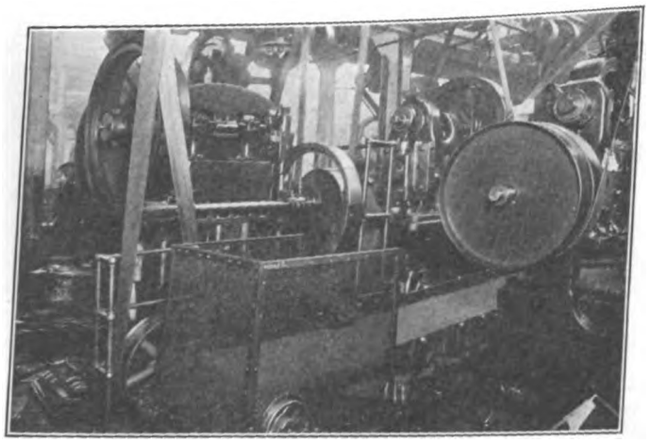


Fig. 1. The belting standardization system is applicable whether a belt is ½" wide or 30" wide, because the ½" belt is just as important in relation to its function as the 30" belt.

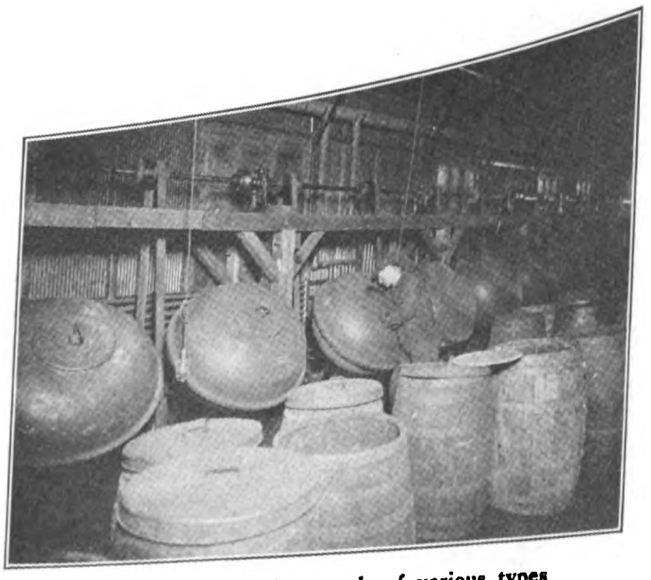


Fig. 2. Tests should be made of various types of belts for each acid, steam, moisture, or grit condition existing in the plant. Only by test can the most economical type be found.

The Control of Mechanical Power Transmission

III—*The Belting Standardization System*

By William Staniar

Belting and Transmission Engineer, E. I. du Pont de Nemours & Co.

IF a system of belting standardization, such as is about to be described, can lower belting costs and give increased production to large plants of the DuPont Company and two of the largest of the General Motors Corporation, there is no reason that it cannot be applied to the great majority of manufacturing plants of the country.

The belting standardization system is a method whereby each individual belt drive is scheduled in chart form, whether the belt in question is ½" or 30" wide, because the ½" belt is just as important in relation to its function as the 30" medium. If the plant is divided into buildings, each building has its schedule with subdivisions for the various floors and operations, and if into areas each area has its schedule with subdivisions for the various buildings and their operations. Each sub-division of the schedule is again sub-divided into four columns, viz. LOCATION—such as 50-hp. motor to head shaft, PRESENT BELT—being the type and size of the belt in use at the time of the analysis; BELT RECOMMENDED—being the type and size recommended for the installation based upon knowledge and the results of testing; FASTENER—being the correct method of joining the belt recommended and should be based upon an intimate knowledge of belting substance and the diameter and speed of the minimum pulley over which the belt is to operate. A cut of the 15" x 20" plant belting schedule is shown in Fig. 3.

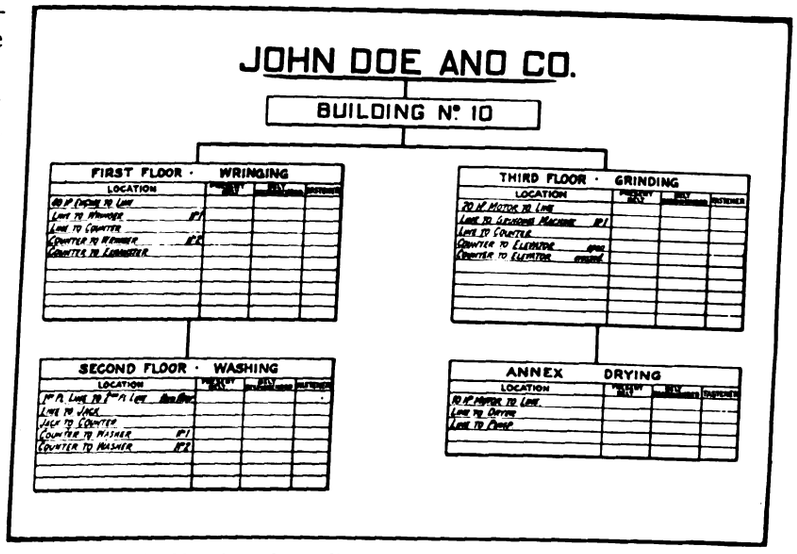
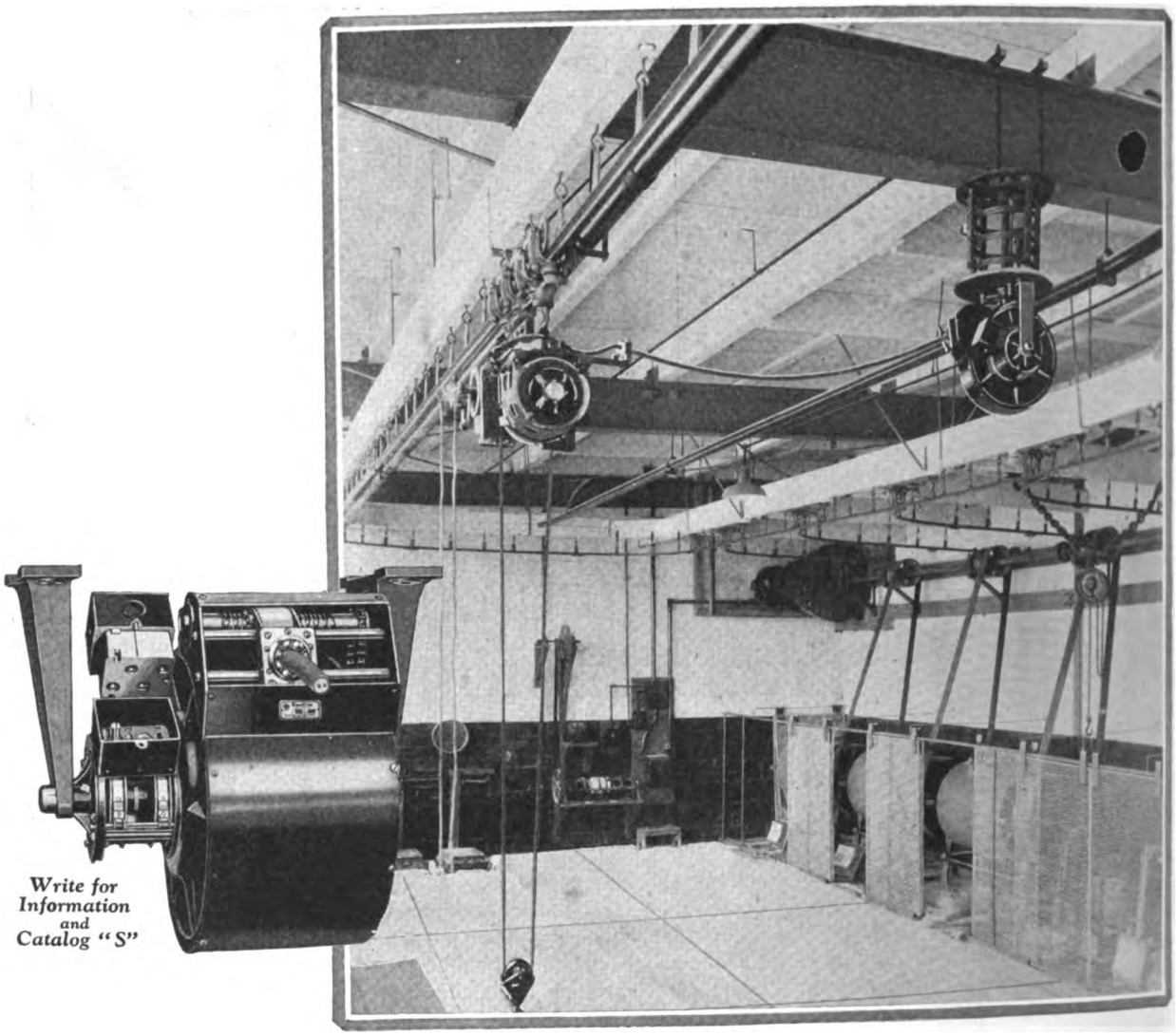


Fig. 3. Showing the salient features of the author's suggested belting schedule—a system which, incidentally, saves thousands of dollars in the plants of General Motors and of the DuPont Company.

If plant belt records of various types have been kept in a systematic manner, over a period of months, the building up of these schedules will be greatly facilitated. However, if no records are available and it is desired to gain the required knowledge by testing under the conditions existing in the particular plant, it will be necessary to inaugurate a testing program. This should be done sectionally, or one test of the various types for each acid, heat, steam, moisture or grit condition existing in the plant.

Tests of this character need not necessarily be run until the belt has actually gone to shreds, because it is

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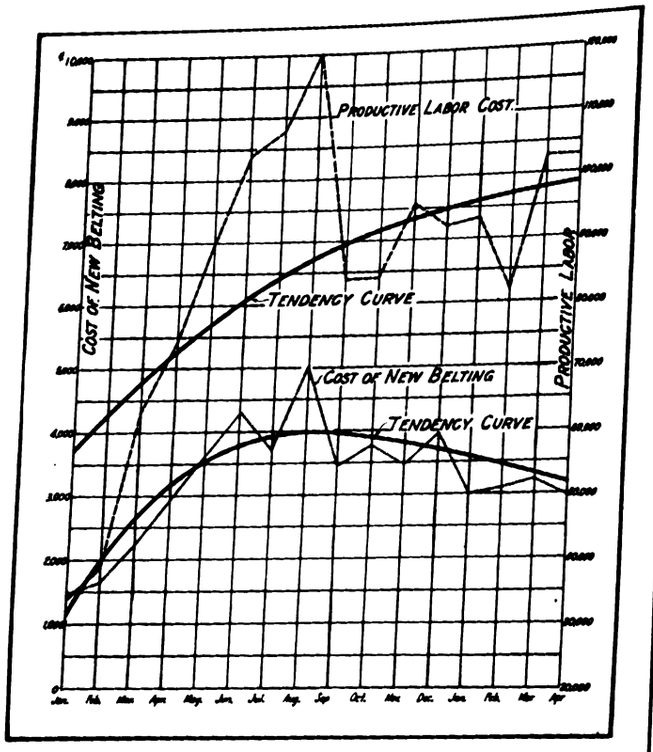
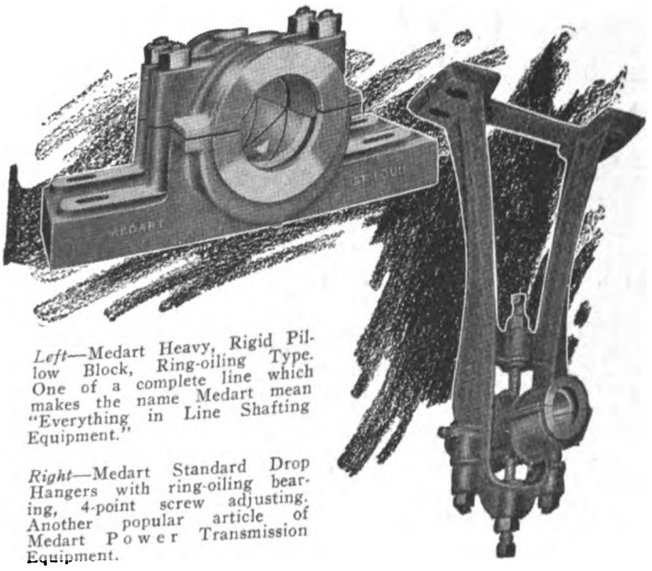


Fig. 4. Showing the actual effect upon belting costs, as compared to production labor costs, in a plant which installed belting standardization in the month of August.

possible to obtain comparative results of one type over another in two or three months' time and in some cases much shorter. The test record card as shown in Fig. 5 will be found convenient for test records. At the conclusion of this testing, which is for type only, the plant should have in its possession reliable and positive information as to the type of belt capable of giving the longest life, least maintenance and best power transmission for each and every condition existing. It is now possible to make an intelligent belting analysis of each individual belting installation in the plant because it will be based on known quantities. The belt survey card shown in Fig. 6 should be used for this purpose, one card for each belt drive. All the facts called for, such as conditions, motor horsepower and speeds, pulley sizes and speeds, method of control, open or crossed, vertical or horizontal and center distance should be supplied from the actual operation. The horsepower and speed in feet per minute can be calculated. This tabulated data must then be studied by the man thoroughly familiar with the entire situation and the type and size for renewal belting selected, based on the knowledge gained from testing and the actual operating data placed on the belt survey cards. The area or building belting schedules can now be built up for actual plant use. If the plant belting renewals are in charge of one man, this man should have a complete set of the schedules for all areas and departments. However, if there is a belt supervisor for each individual area or department, he should have the schedules for that particular division only, as he is not interested in any other.

The schedules are for renewal belting only and should be consulted when a replacement is necessary. When a belt is installed as per the departmental belting schedules there is no question as to its fitness for the work. It has been proven.



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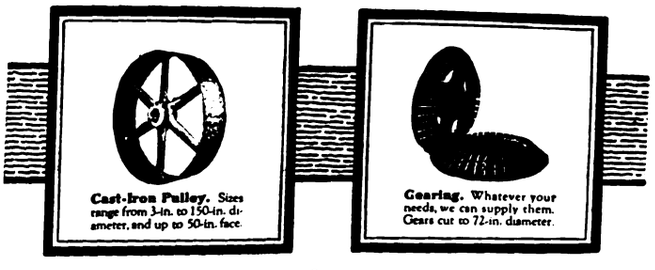
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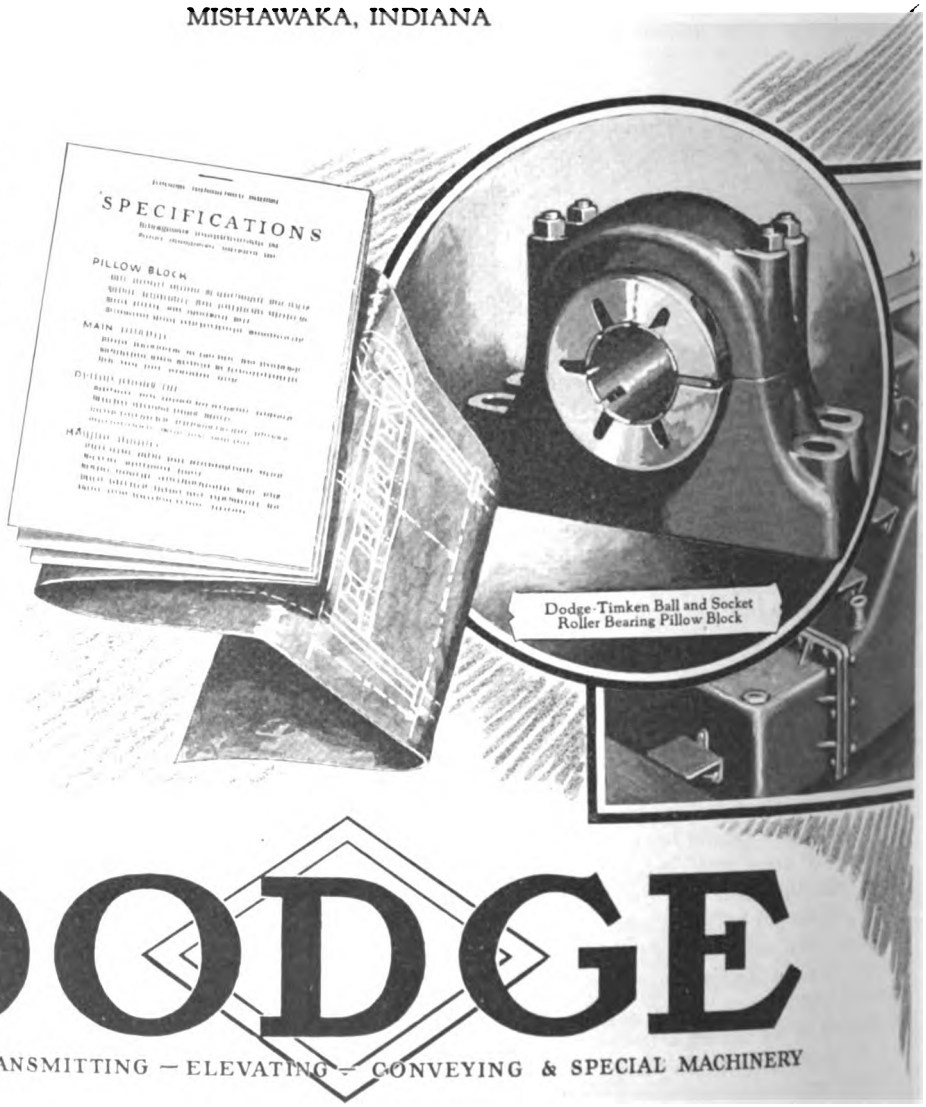
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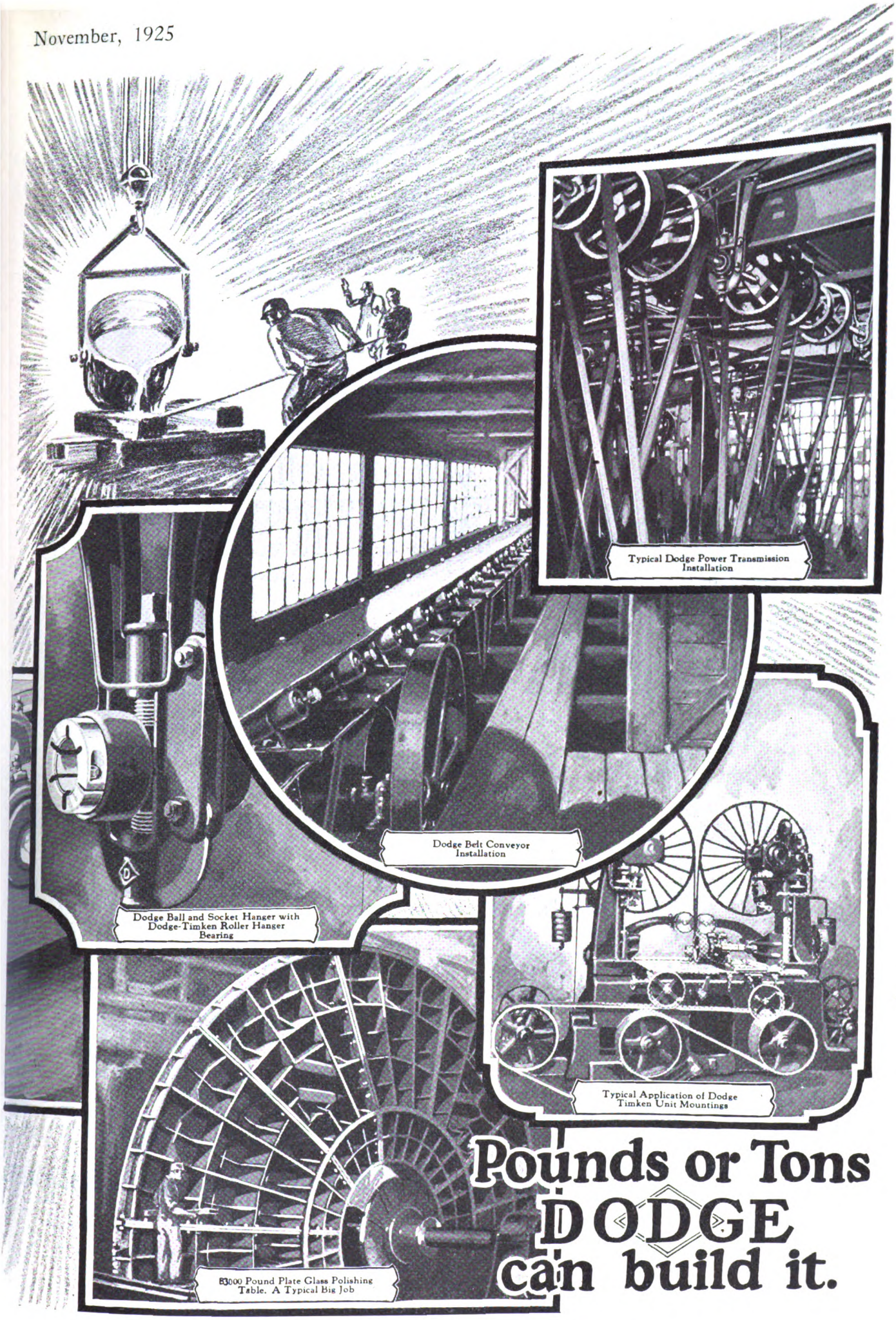


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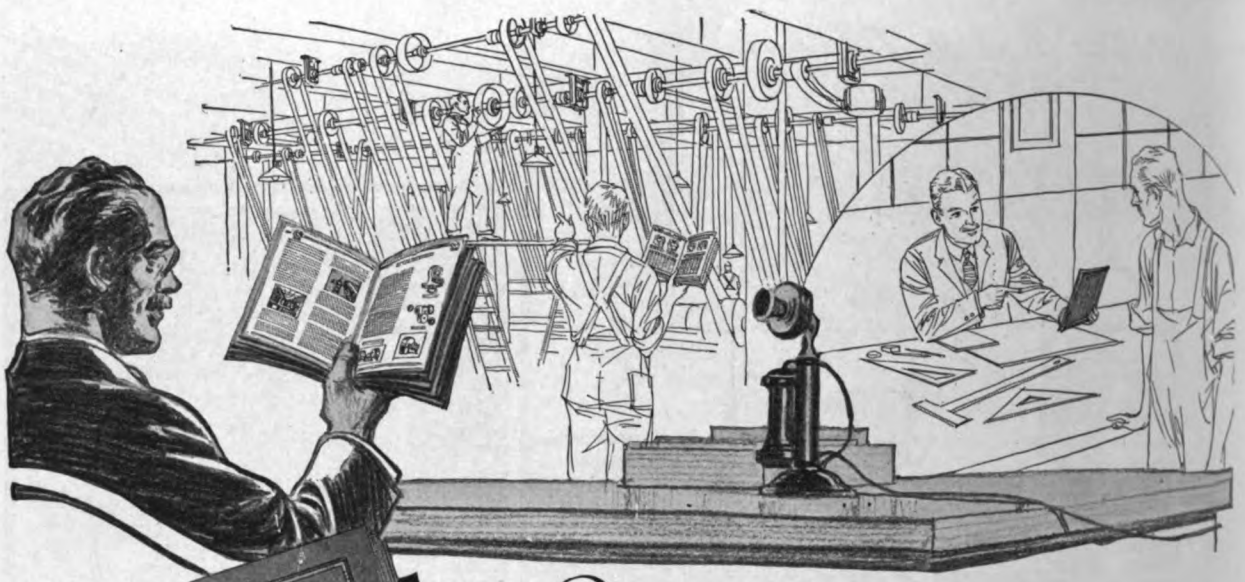
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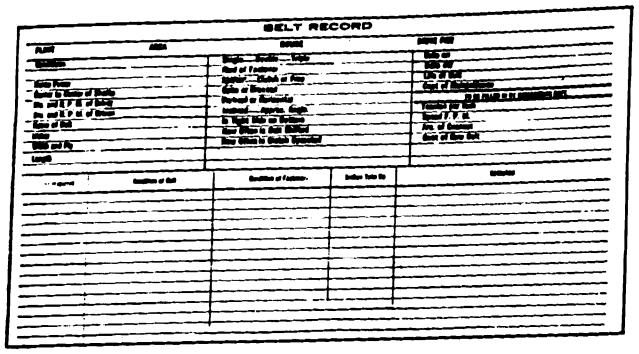


Fig. 5. Record card for recording the results of belting tests. Note the detail with which such tests are to be recorded. These records, with those of Fig. 6, supply the data for charting, as shown in Fig. 1.

Improper methods of joining the ends of transmission belting are the fundamental causes of approximately 50 to 60% of premature breakdowns. Valuable belting has been totally destroyed in a few days owing to the wrong type and size of metallic fastener being applied. If it were possible to install all belting endless, joining troubles would be over, but as this is not possible consideration should be given the following points and requisites:

Mechanical and Atmospheric Conditions

1. Diameter and R. P. M. of smaller pulley.
2. Speed of belt in F. P. M.
3. Type and size of belt.
4. Wet, steam or acid conditions.
5. Belt tension.
6. Power to be transmitted.

Efficiency Requisite for Belt Joining

1. Sufficient strength.
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5. Even distribution of strains.
6. Safety.
7. Snug fit to pulleys.
8. Ease of application.
9. Rapid adjustment.
10. Entire width joined.

Belting costs generally follow production labor costs where there is no system of belting standardization and control. Investigations in a number of plants have proven this fact and have also proven that when there is a control the lowering effect on these costs in relation to productive labor is obvious almost immediately.

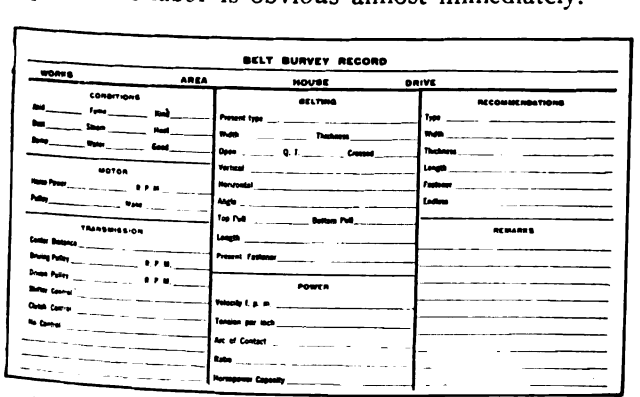
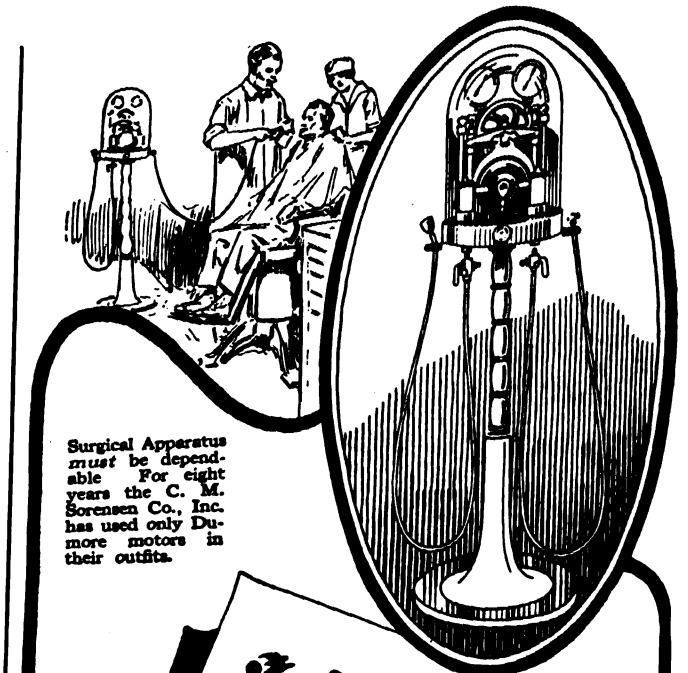
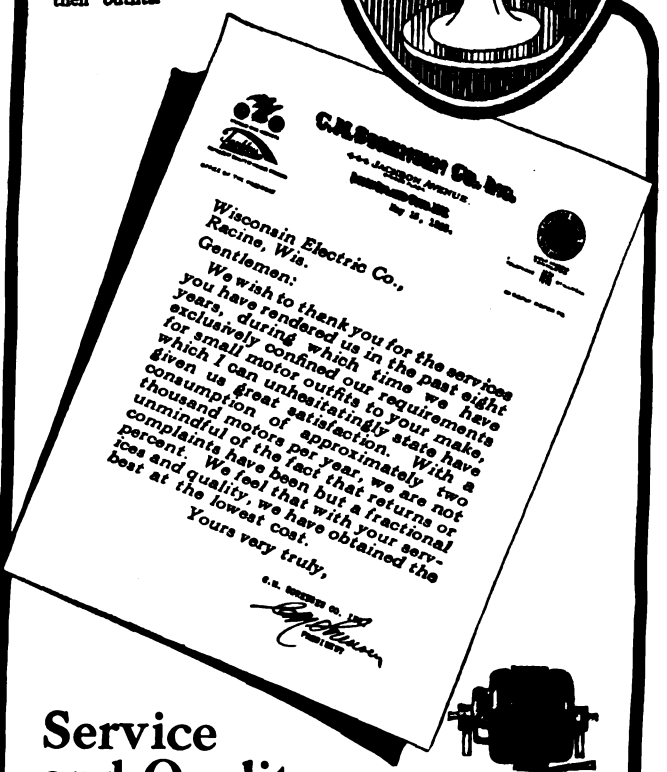


Fig. 6. A belting survey card, used for recording an analysis of conditions for each drive.



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Yours very truly,

Service and Quality

at the Lowest Cost

That's the verdict of C. M. Sorensen, Long Island City, N. Y. And Mr. Sorensen ought to know, because he has used a large quantity of Dumores in the last eight years.

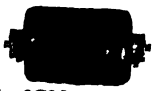
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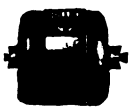
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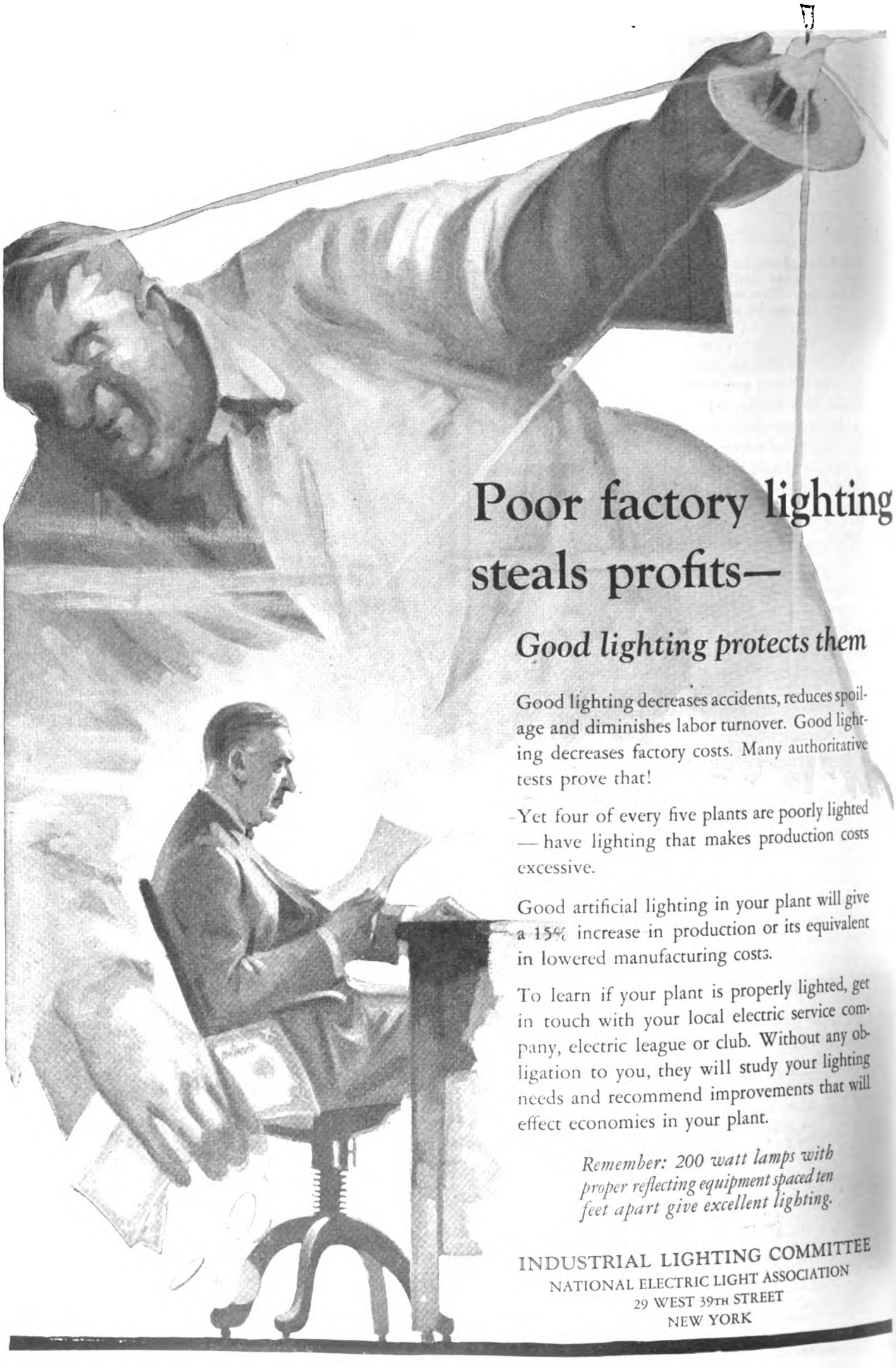


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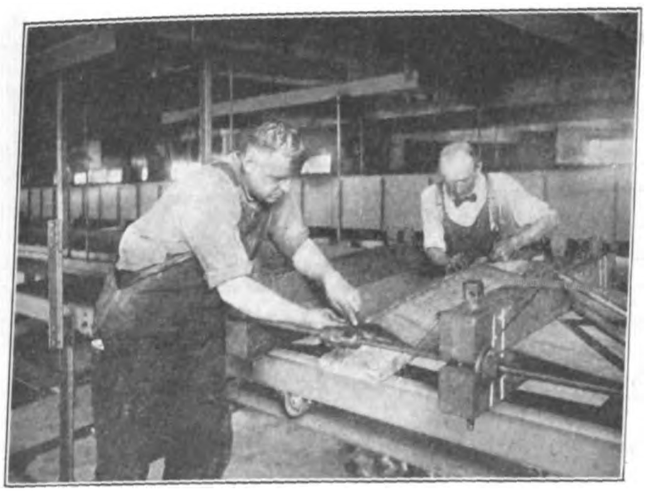


Fig. 7. Improper methods of joining the ends of transmission belts are the fundamental cause of approximately half the premature breakdowns. It is surprising how many badly-joined belts are found in the average plant.

Fig. 4 illustrates the actual effect of the schedule system of standardization on belting costs in relation to production labor costs in a large plant recently surveyed. It will be noted that from January to August production labor increased from $30,000 to over $120,000 and the belting increased in proportion from $1,000 to $5,000, this being before the control system went into effect. During the latter part of August the belting schedules were placed throughout the plant and by October the tendency of belting costs was downward, while the tendency of labor costs continued upwards. By the following February and March there appeared a marked effect. Belting costs had dropped to $3,000 with production labor at $105,000. This illustration shows the value of belting control and its almost immediate effect on plant costs and proves that the most dependable protection against the invisible losses of power transmission is belting standardization.

The standardization and schedule system of belting application is practicable because it is based on engineering facts and experience, and, as engineering cannot be divorced from industry, this science must be applied to belting selection and control, because belting is an industrial essential and has a direct influence on the profits or losses of a manufacturing organization.

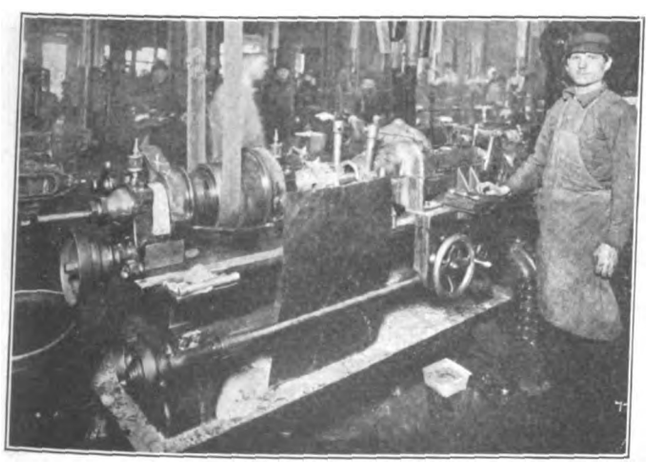
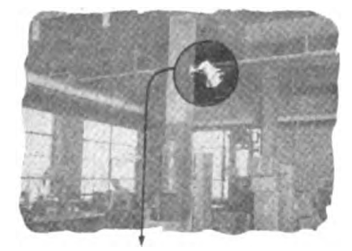
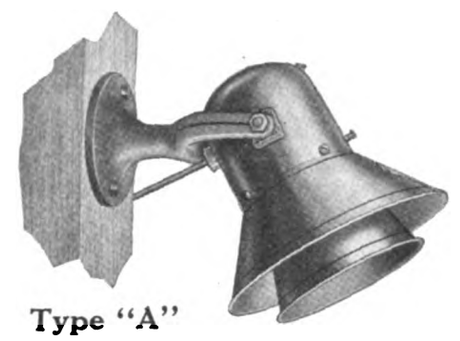


Fig. 8. Workmen and millwrights know their own work, but they cannot be expected to know the characteristics of all the many hundreds of brands and makes of belting.

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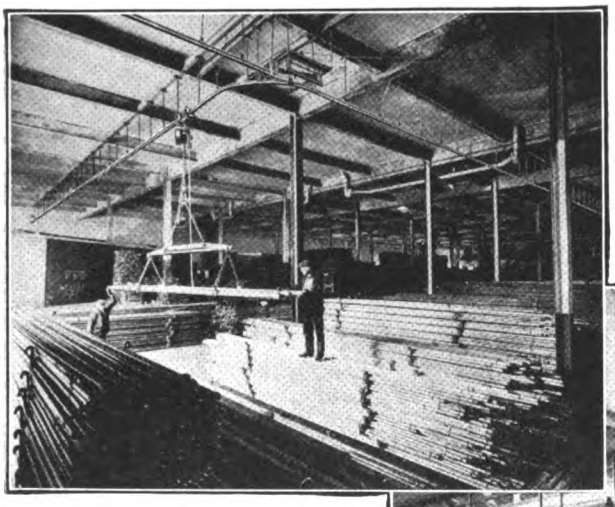
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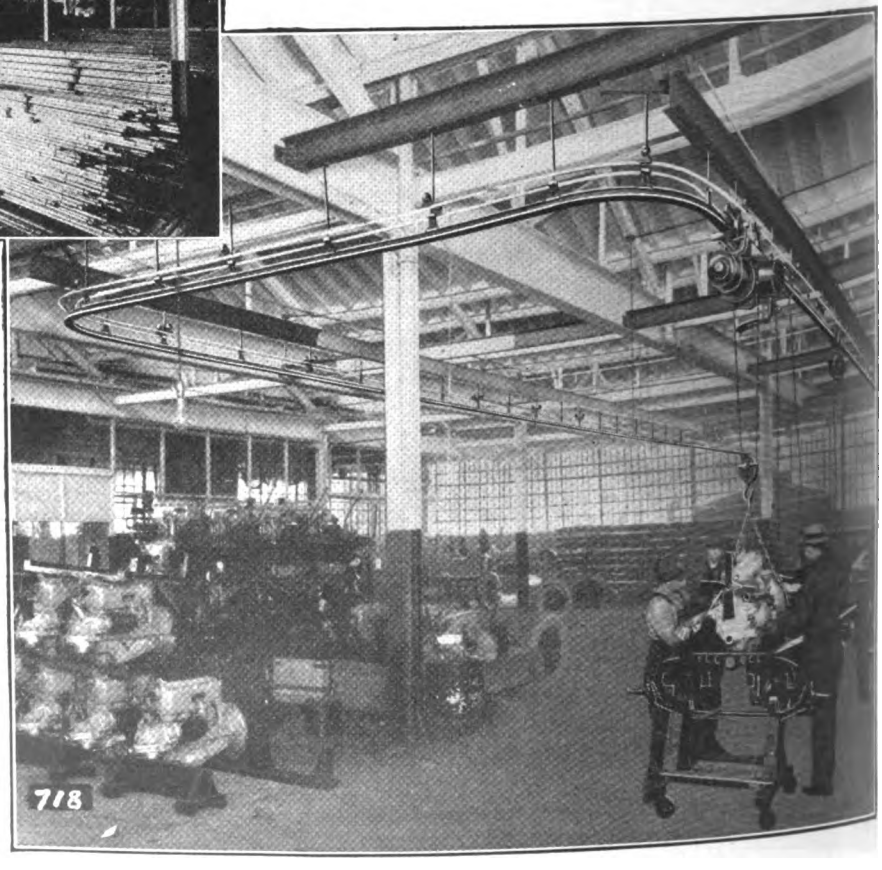
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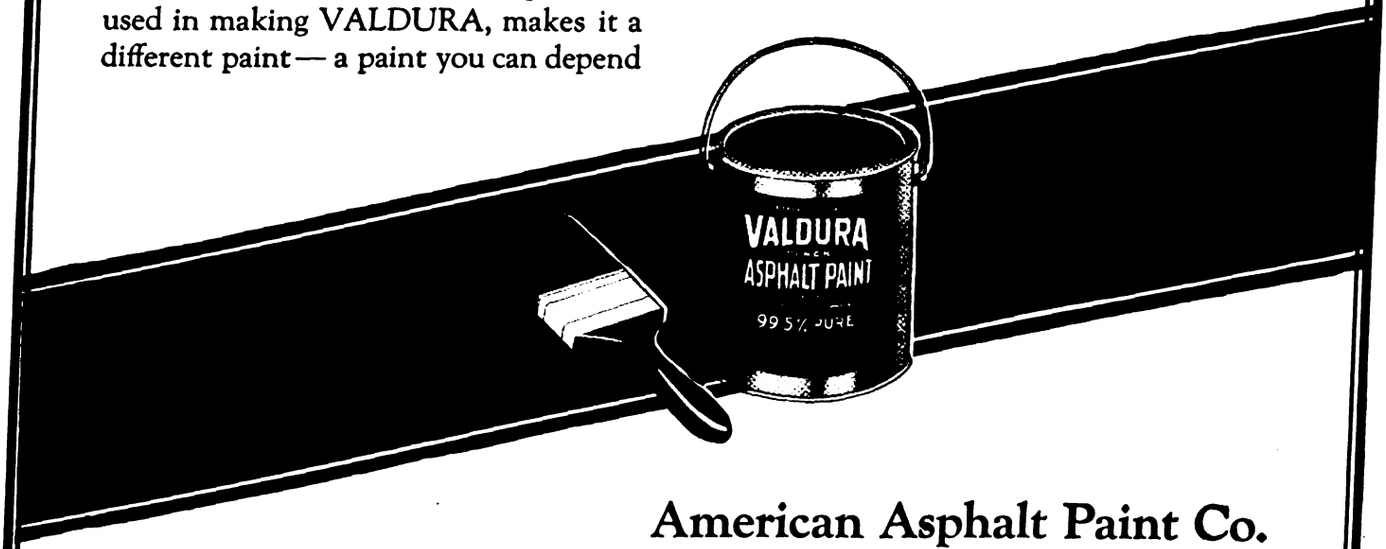
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How a Six-Ton Magnet Is Used in a Modern Foundry

By Robert F. Salade

IT was my good fortune recently to visit the new foundry and machine shops of the Duplex Printing Press Company, located in Battle Creek, Mich. Many innovations have been incorporated in the design and construction of this great manufacturing plant, including the installation of a 6-ton magnet system, and by means of which a great deal of manual labor is being saved.

The new foundry, machine shops and erection floor of the Duplex works together form a modern, "daylight" factory building one-quarter mile long by 300 feet wide. The older buildings of this plant have an additional floor space of 40,000 square feet. It would require a good-sized book to present a complete story of this plant, but the facts in this article will refer particularly to the innovations in the new foundry and the utility of the 6-ton magnet which serves the foundry.

In the foundry proper is a spacious charging platform, arranged entirely under cover, and having a storage capacity for 5,000 tons of metal and ten carloads of coke at one time. The method of unloading raw material from the freight cars in single operations, either through manholes to bins underneath the charging platform, or to special places on the platform, is worthy of note. The entire works are now so arranged that the foundry, machine shops, erection floor, etc., are all closely connected, and are served by a battery of powerful electric cranes, thus providing a most efficient means for straight-line routing of work.

The foundry is 110 feet wide by 180 feet long, and is equipped with a ventilating system of the Pond operating type, this system keeping the big room clear of gases at all times. Both foundry and machine shops are of steel construction with all-glass walls and monitor roofs.

At the east end of the foundry is located the unloading bay for raw materials. This bay is entirely inclosed and will handle one freight car at a time. Outside the plant the railroad tracks are divided into two spurs. Loaded cars may be kept on one of these spurs while empty cars can be shunted onto the other. The

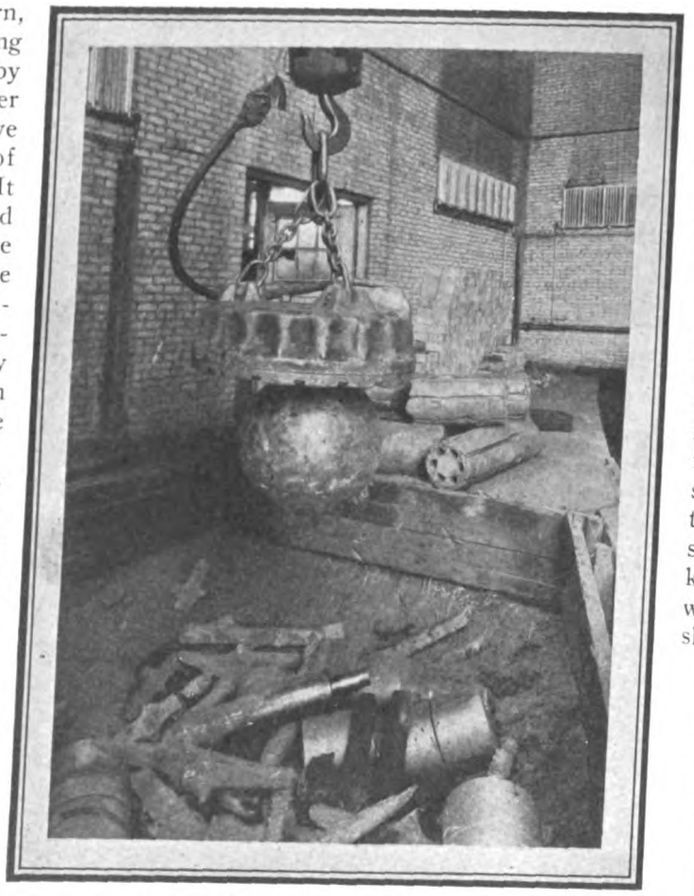


Fig. 1. The 6-ton magnet and its 1-ton iron ball, being used for breaking up large pieces of scrap iron.

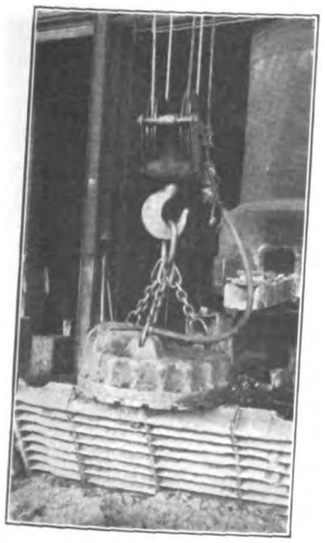


Fig. 2. "Shaking out" a heavy casting from a mold.

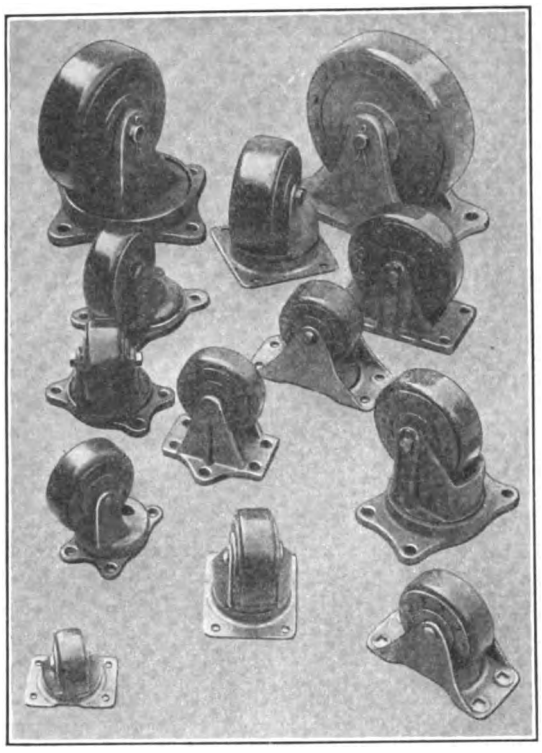


Fig. 3. A view of the new foundry.



Fig. 4. This illustrates the 6-ton magnet engaged in the work of "shaking out" castings from the molds.

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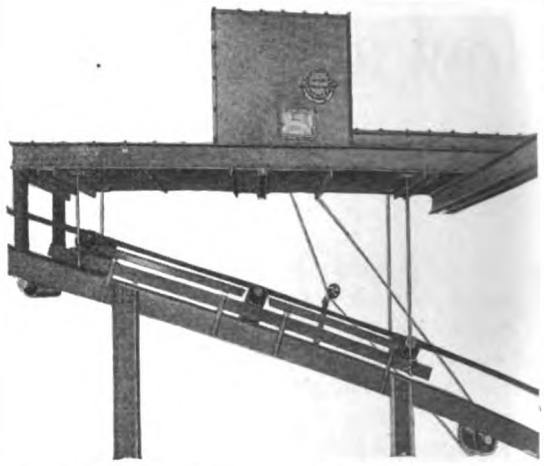
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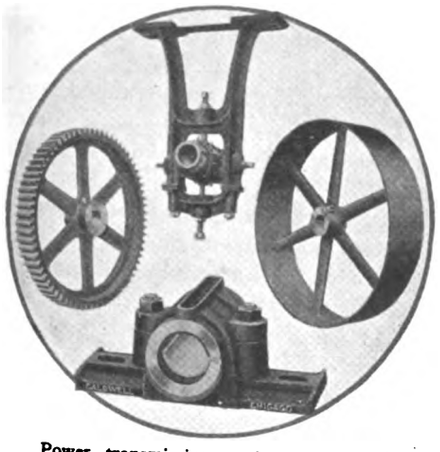
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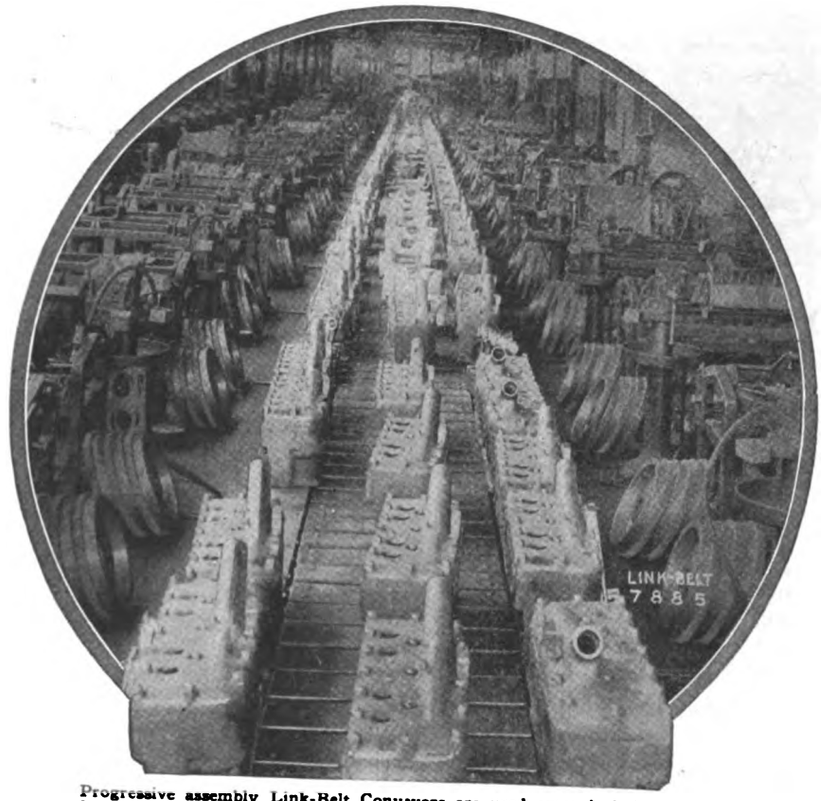
There is a Link-Belt Chain made to fit every need in elevating, conveying and transmission of power. Stocks maintained at important manufacturing centers insure prompt delivery.



Link-Belt Silent Chain is the ideal drive, because it is a strong, long-lived, positive, yet flexible means of transmitting power. Drives from ½ to 10 H. P. in stock at a distributor near you.



Power transmission equipment, rugged and well constructed for continuous operation, bearings, gears, hangers, pulleys, sprockets, grease cups, safety collars, etc.



Progressive assembly Link-Belt Conveyors are used extensively in manufacturing and assembling plants. The illustration above may be a suggestion for you. Consult with Link-Belt engineers.

Cut Costs—Speed Production with Link-Belt Equipment

THERE must be many opportunities in your plant to effect great savings in costs as well as to increase production—through the use of more efficient material handling and power transmission equipment.

Fifty years' experience, during which time we have furnished reliable equipment to all industries, are at your service.

The advantages of specifying Link-Belt equipment are threefold: First, every unit or part is properly made to fit your individual requirements. Second, every Link-Belt product is made to meet the most exacting standards of manufacture—to give maximum results in service. Third, Link-Belt's interest in the performance of your equipment never ceases.

Whatever your needs may be, now—or in the future—it will pay you to consult Link-Belt.

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Elevating, Conveying and Power Transmission Machinery

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Install Rundle-Spence Vertico-Slant Fountains and you will be providing drinking sanitation forever. They are made to satisfy thirst sanitarily—to invigorate your workmen to increased production—and to save waste "time and motion" on their part.

Notice the R-S nozzle—*lips can't touch it.* The spreading of contamination through lip-contact is positively eliminated. The slight slant stream makes drinking easy, quick and convenient.

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To the Minute!
DETEX
"ECO"
Portable Watchclock System
Gives *Exact Time* Registration

There are many plants and institutions where watchmen must visit certain spots at exact times. For such requirements the Detex ECO Portable Watchclock System is uniquely fitted. It records the time of registration practically to the minute. No other watchclock built is so precise.

In addition to its ultra-precision, it is a durable clock and makes a beautifully clear-cut punch record, which cannot be imitated, altered or tampered with in any way. For plants requiring such exact time recording for 6 to 20 stations, the ECO has no rival.

Write for literature describing this unusual watchclock system

DETEX WATCHCLOCK CORPORATION
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Other DETEX Watchclock Systems
PATROL Portable—The latest and most versatile of all portable watchclock systems. Equally satisfactory for 1 or 100 stations.
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ALERT Portable—Ideal for plants requiring up to 30 stations. Initial cost moderate—maintenance extremely low.
BOSTON [Magneto Type]—for large plants desiring records of a number of watchmen on one dial.

material is moved from the loaded cars, either by means of the electric magnet or grab-buckets, and the material is then hoisted by a 5-ton electric crane to places provided for it. Molding sand is dropped through manholes into bins underneath the charging floor.

One of the important features of the unloading bay is the pit that is used in the process of breaking up large pieces of scrap iron. It is a thrilling sight for the visitor. In this process the 6-ton magnet first lifts a solid ball of metal weighing one ton to a height of 30 feet above the pit containing the pile of scrap iron. Upon reaching this height the magnet is made to drop the ball of metal down upon the pile of scrap iron.

The Whiting cupola measures 60 inches in diameter; is equipped with double charging doors, and takes from 15 to 17 tons of metal. This metal can be moved from storage on the charging floor to the weighing scale, or to the charging floor trucks, by the magnet referred to.

On certain occasions, the magnet is used in conveying a batch of broken scrap iron directly from the pit to the scale on the upper floor, where the charges are weighed. The magnet is also frequently utilized in carrying loaded all-metal cars about the platform. The magnet is very frequently used in moving empty all-metal cars from one place to another.

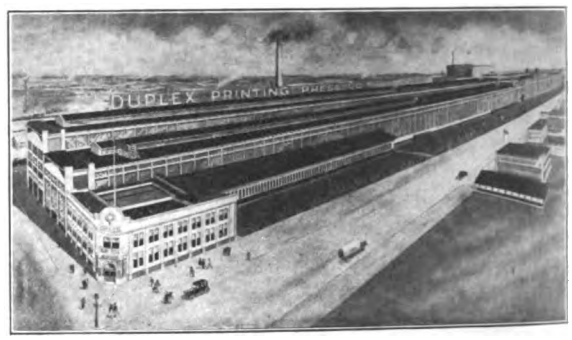


Fig. 5. The plant of the Duplex Printing Press Co., Battle Creek, Mich.

Underneath the charging platform are arranged storage space for flasks, sand bins, cupola bay with cinder mill and storage for fire clay, the core-room, the core ovens, storage for active patterns, and wash-rooms for the men of the foundry. Each sand bin is provided with two chutes, one for facing and the other for blacking. The facing and blacking materials are unloaded into the chutes through holes from the charging platform above. There is also a hole in the charging floor above the cupola bay, through which hole the magnet is lowered for the purpose of separating metal from cinders taken from the cinder mill.

All of the flasks are of metal. The foundry is served by one 5-ton and one 10-ton crane, and all of the castings are conveyed by magnet to the cleaning department, thus eliminating tackle which is sometimes dangerous.

It is very interesting to see the 6-ton magnet at work in the foundry "shaking-out" newly-made castings from their molds. The magnet and its crane are so flexible that it is a comparatively easy matter for the operator of the magnet to move it to almost any place in the foundry. With no difficulty whatever the magnet can be made to "shake out" the largest sizes of castings from the molds, and not only does it accomplish this heavy work to great advantage, but it also carries the castings to the cleaning department.

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Here's a truck caster wheel *that* will---



• • **roll silently**—Yes, as silently as balloon tires. See its thick rubber tread—that means silence, on any kind of floor: old floors, new floors, good floors or bad—Ruboids take the bumps.



• • **roll easily**—Firm, solid construction—laminations of rigid wood—tough rubber between, tough rubber all around. No wonder you get such easy traction with Ruboids.



• • **roll smoothly**—"Give and take"—that's the principle of the Ruboid wheel. Rubber and wood—resilient enough to take the bumps—rigid enough to withstand them.



• • **roll harmlessly**—And that's important if your floors cost money, and all floors do. Ruboids can't crack or wear floors. Rubber and wood construction prevent it.



• • **roll "lastingly"**—Why shouldn't Ruboids last longer? See how they are made. A solid mass of staunch wood and tough vulcanized rubber. Ruboids wear—wear—wear!



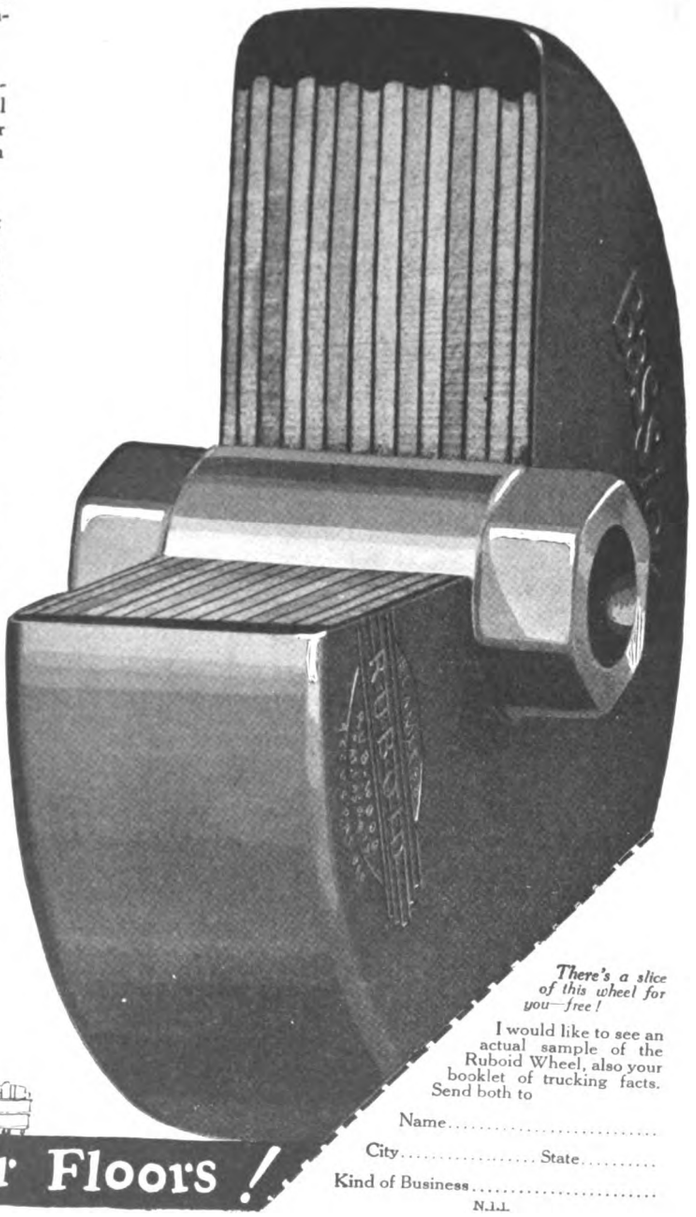
• • **roll evenly**—Because they cannot wear away on one side only—at any one point. Why be bothered with wheels that have to be trued when there are Ruboids?



• • **roll happily**—Isn't that just about everything a truck caster wheel should do—roll so easily, so silently, so smoothly, so harmlessly and so "lastingly" that they are easy to live with—a pleasure to buy. You've often asked for such a wheel—now you can get it.

NEW!

There never has been a wheel that could do all the things this wheel will do—but there never has been a wheel built like Ruboids—laminations of staunch wood held fast in a mass of vulcanized rubber.

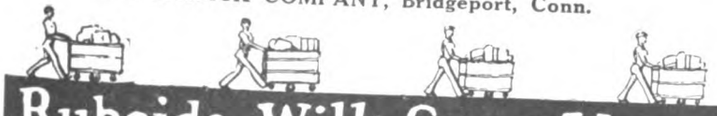


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THE BASSICK COMPANY, Bridgeport, Conn.



Ruboids Will Save Your Floors!

There's a slice of this wheel for you—free!

I would like to see an actual sample of the Ruboid Wheel, also your booklet of trucking facts. Send both to

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"Buffalo" Equipment For Every Shop

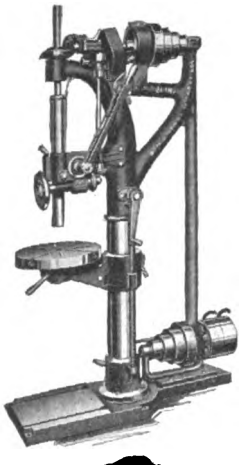


Whenever you're in the market for forges, drills, punches, shears and bar-cutters, blowers, exhausters or combination wood-working machines remember that there is a Buffalo to fit your particular requirements. Backed by more than 45 years of manufacturing experience, every Buffalo machine represents the greatest possible VALUE!

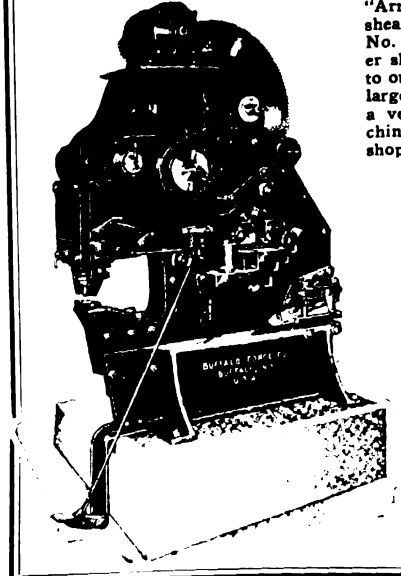
The Buffalo No. 210 Rivet forge shown at the left is a favorite with contractors from coast to coast. Has a heavy, deep one-piece steel plate hearth, without seams of any kind. Hearth is rust-resisting, unbreakable and light. Blower is the Buffalo No. 200, guaranteed against wearing out for 10 years.



The No. 236-H forge is used for manufacturing and repair work. Hearth is one piece seamless steel plate, 24x24" by 5¾" deep. This forge is light but very strong. Can be packed for shipment in small space.



We make a very complete line of drills for power and hand operation. The 21" shown here drills to center of 21" circle, has a long travel of spindle (12½") gear driven power feed, and many advantages.



Last of all, the Buffalo "Armor-Plate" punches, shears and Bar cutters. The No. ½ Universal Iron Worker shown is a recent addition to our complete line, has very large capacities, and sells at a very low price. This machine will save money in any shop that fabricates metal.

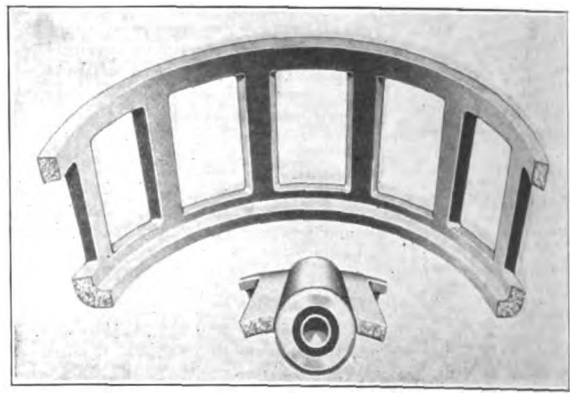
Write for our catalogs, mentioning the machines you are interested in.

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Features of the Improved Timken Bearing

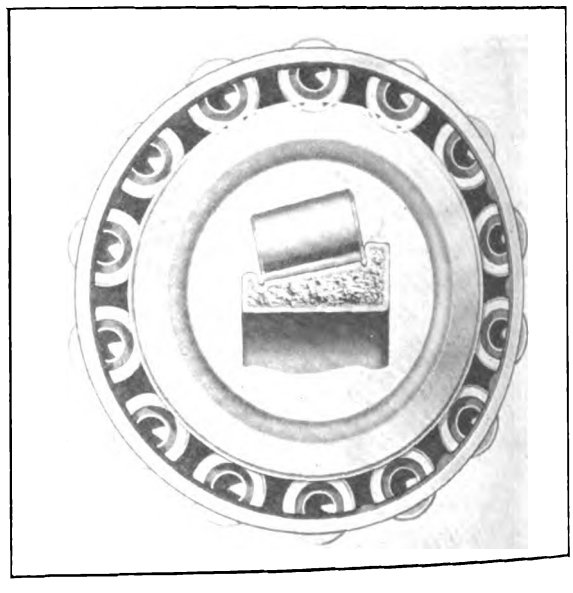
AN improved type of Timken Tapered Roller Bearing, differing from the well-known Timken Bearing in major refinements but retaining all essential elements, which have characterized Timken tapered design, is now in production.

Nickel-molybdenum steel, of special Timken formula, has been adopted for all bearings. The inclusion of the alloys, nickel and molybdenum is said to produce a steel



possessing properties of grain texture, toughness, hardening, heat treating and machining which reflect favorably in the life of anti-friction bearings.

Varied changes in the bearing itself are noteworthy. The design of the roll has been changed so that the surface of the large end presents a right angle relation to the center line of the roll. The contact then between the large end of the roll and the rib of the cone is in two

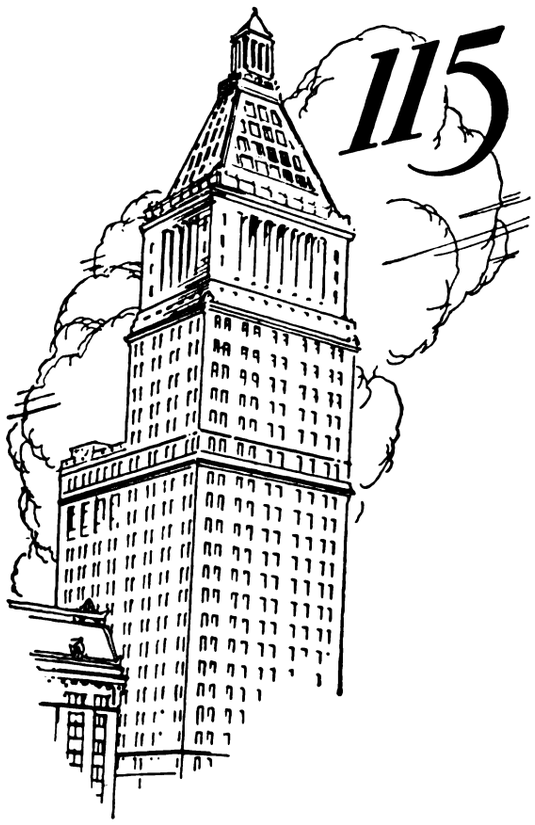


areas, the rib of the cone being slightly undercut. This two-area contact is said to insure perfect axial alignment between the center line of the roll and the center line of the bearing at all times. Likewise the manufacturers point out, there is always absolute line contact between the surface of the roll and the surface of the cone, and between the surface of roll and the surface of the cup.

An added purpose of the two-area contact is self-alignment of rolls on cone, in the cup without resorting to a

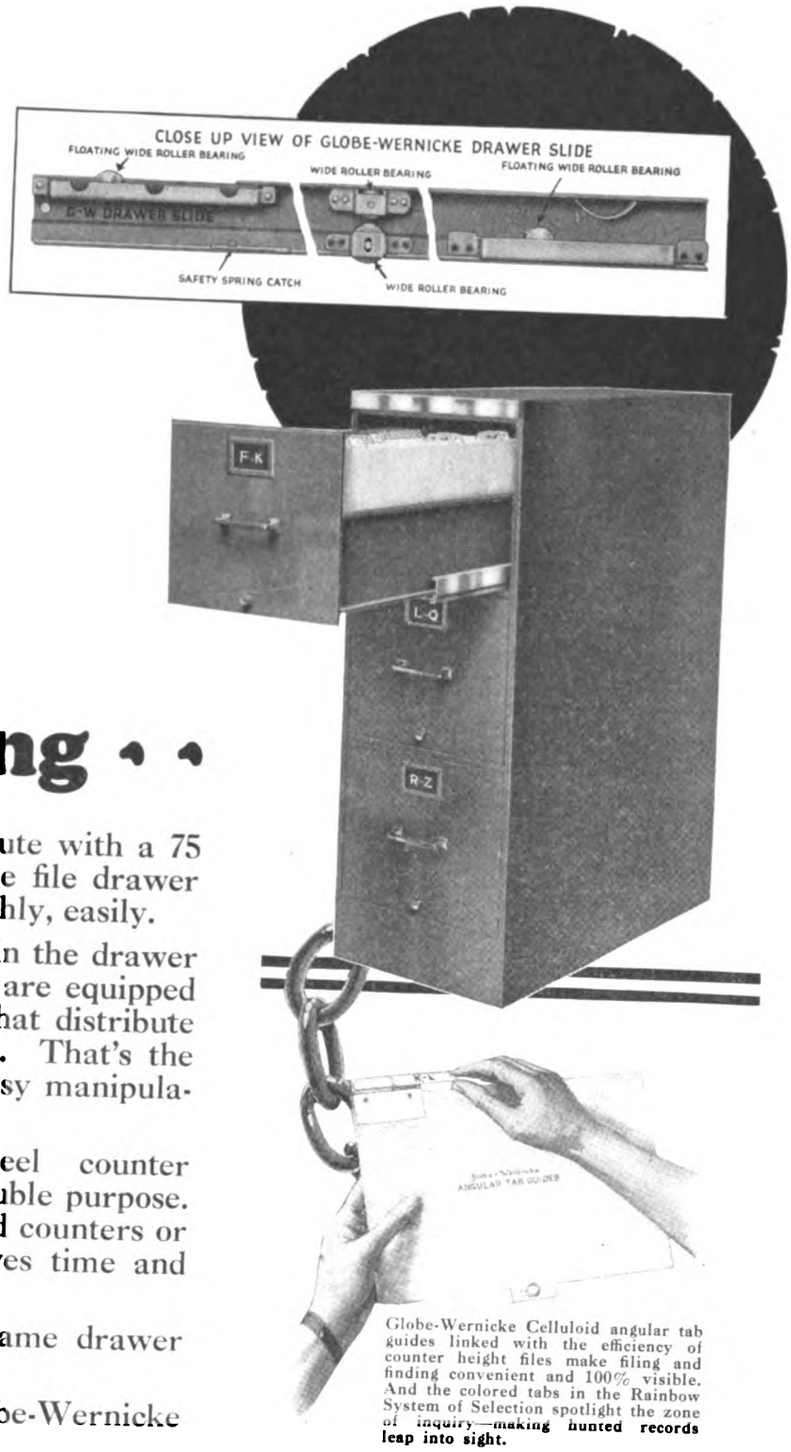
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Business organizations in the towering Union Central Building, Cincinnati, use Globe-Wernicke office equipment to shorten their work and increase their efficiency.



276,000 and still going . .

276,000 trips out and back—20 a minute with a 75 pound load. And the Globe-Wernicke file drawer at the last count was still going, smoothly, easily.

The life of the correspondence file is in the drawer slide. Globe-Wernicke drawer slides are equipped with wide, free floating type rollers that distribute the load over a wide bearing surface. That's the secret of their wear resistance and easy manipulation.

Globe-Wernicke linoleum-topped steel counter height correspondence files serve a double purpose. When grouped they do duty as files and counters or partitions, a two-fold service that saves time and office space.

Other Globe-Wernicke files use the same drawer slide.

Let your next files be permanent—Globe-Wernicke files.

For further particulars mail this coupon.

THE GLOBE-WERNICKE CO.
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Globe-Wernicke

Globe-Wernicke Celluloid angular tab guides linked with the efficiency of counter height files make filing and finding convenient and 100% visible. And the colored tabs in the Rainbow System of Selection spotlight the zone of inquiry—making hunted records leap into sight.

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Gentlemen: Please send me your Office Efficiency Handbook and information concerning Globe-Wernicke Counter Height Files using Celluloid tab guides and the Rainbow System of Selection.

Name .....

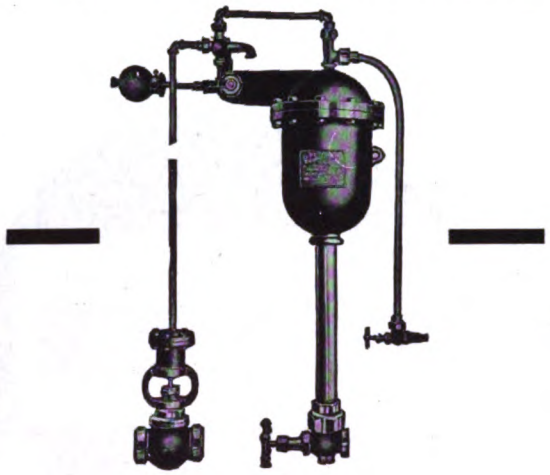
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Why not take advantage of our service and ask one of our engineers to call He'll be glad to advise you in regard to correct boiler maintenance; will demonstrate the safety, the accuracy and the dependability of the Vigilant Feed Water Regulator; he'll be glad to show you how the Vigilant operates under your conditions and in your plant. He'll show you how the Vigilant maitnains the proper water level at all times, under all loads.

And again, he'll show you why the action of the Vigilant is entirely automatic — there being no floats, tubes or diaphragms to get out of order. And best of all he'll show you how the Vigilant can save in operating costs.

Write for him today.

The Chaplin-Fulton Mfg. Co.

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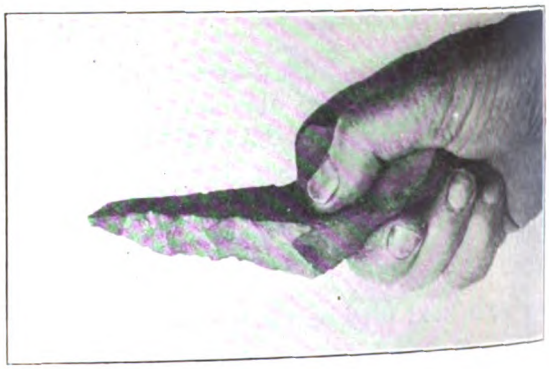
SINCE the hoist buying public has learned of the exclusive improvements of the WRIGHT High Speed Hoist we could very easily sell them at an advanced price. *But We Don't.*

cage fixture to retain the alignment. The primary purpose served by the cage is to retain the rolls, properly spaced about the cone and to make the cone with its set of rollers a unit assembly. The skewing of the roll on the cone raceway is claimed to be impossible, since the two areas on the end of the roll make generously separated points of contact with the shoulder or rib of the cone, as shown in the illustration.

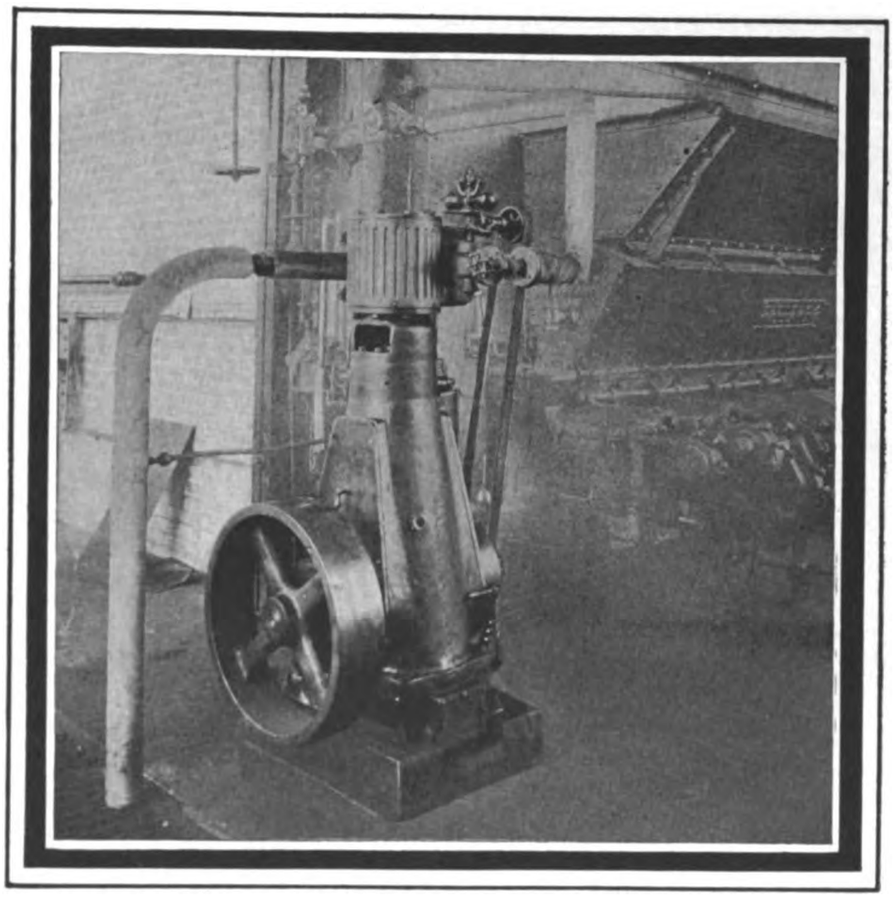
The Timken cage has been improved along with the cone and roller assembly. Previously, the cage was cold pressed into the shape of a cup, the bottom stamped out and the pockets for the rolls punched out, one at a time, by an automatic punch press. The result of this single stamping operation was positive uniformity of cage pockets, yet a progressive error in alignment, due to stretching of the metal, as the indexing fixture advanced the metal cage to the final perforation. To correct this microscopic error, a multiple perforating die was developed which perforates all roll pockets in the cage, by a single impact. To further safeguard against any possibility of error during this operation, due to distortion, an inwardly turned flange has been retained on the smaller side of the cage. To insure smoothness and a perfect fit of the rollers in the cage the lateral edges of the cage are swedged inward so that the contour of the sides of the cage pocket conform to the contour of the roll. This operation is termed "winging." Dies similar to the multiple perforator are used, so that all cage pockets are winged simultaneously. The inwardly turned flange and the result of the winging operation are shown in the illustration.

An Aboriginal Saw

A SURVIVAL of the Stone Age, when man killed his game with spears or arrows tipped with flakes of flint, skinned his trophies with jagged bits of rock and sewed his fur garments with fish bone needles is found in the Maori stone saw shown in the accompanying illustration. A photograph of this curious tool was sent to Henry Disston & Sons, Inc., Philadelphia saw manufacturers, by a correspondent in New Zealand. It was made by some New Zealand native with blade and handle shaped from a single piece of stone. The cutting edge is very skilfully chipped to serve as teeth. It was from such beginnings as this that modern saws, in all their varied forms, have been developed.



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A Typical Troy Engine Installation driving the stokers in an industrial power plant.

A Compact Powerful Unit that Lowers Power Costs

for

Driving Fans
Stokers
Blowers
Pumps and
Generators

With a Troy Engine in the boiler room, lower power costs are assured right at the source where the steam is generated.

The Troy is a compact unit built for safety, reliability and continuous operation. Yet the cost of a Troy Engine is less than the average engine on the market. Why?

Because every Troy Engine built embodies 34 years' experience in design and construction by a plant building steam engines and good steam engines only. Economical operation insured by relatively long connecting rod, properly balanced reciprocating parts and positive lubrication of every bearing surface. Grit and dust eliminated by dust-tight casing. Long wear and service guaranteed on every TROY part by our own foundry where parts are produced under personal supervision of our own engineers. Absolute safety assured by compensated type of steam admission valve, automatically held steam tight under all conditions, but can lift from its seat to relieve the cylinder from excess condensation.

Furnished in capacities to 200 Brake Horsepower.

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TROY ENGINES

Dependable Power with Absolute Safety

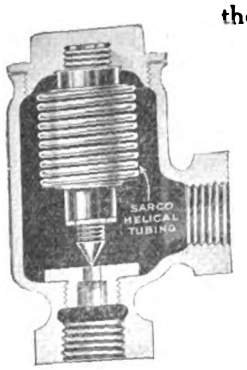
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The Steam Trap with a Brain!

That's what one of our customers called the New No. 9 Sarco Steam Trap because its motor element seems to know what pressure to apply to open and close the valve promptly at **any** steam pressure between 0 and 100 lbs.

It **adjusts itself** instead of having to be adjusted for a particular pressure. That saves time and work. Does away with danger of inexperienced help making wrong adjustments.

Sarco Steam Trap motor element is made of seamless **helical** bronze tubing, thus distributing the movement over the entire number of corrugations and increasing the life of the bellows.



Has large valve area and quick lift when discharging. Closes instantaneously and allows no steam to pass.

The Sarco has but one moving part—no toggle joints, levers, buckets, etc. Is all bronze so will not rust and stick.

At one-third the cost of large traps, the Sarco will do the same work.

Let us send one on free trial. Mail the coupon today.

SARCO

STEAM TRAP

No. 9

SARCO CO., Inc.
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FREE TRIAL COUPON

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236 Broadway,
New York City

Please send us on free trial 1 No. 9 Sarco Steam Trap as follows:

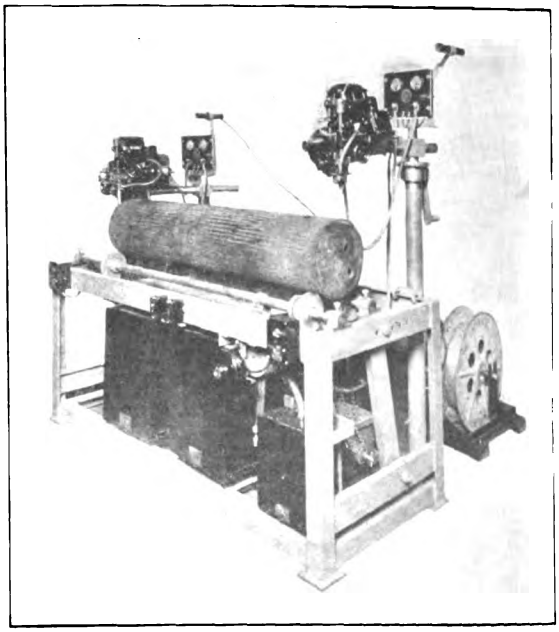
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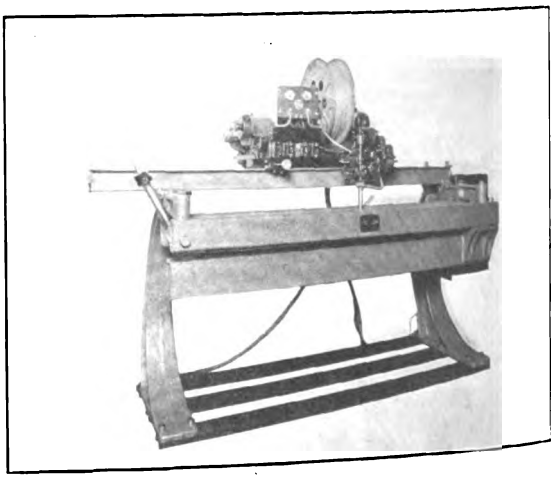
New Arc Welders for Tanks or Range Boilers

THE latest addition to the General Electric automatic arc welding line is equipment especially designed for the construction of range boilers and small tanks. This equipment includes two separate automatic arc welding machines, one for welding longitudinal seams and the other for circular seams. Tank sizes accommodated run from 11 to 33 inches in diameter and up to six feet in length.

Economy in manufacture is the principal advantage claimed for the automatic arc welding process. General



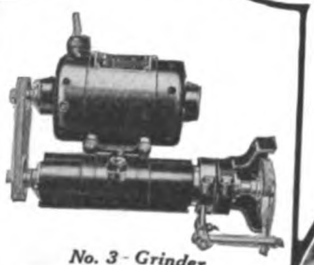
Electric estimates show that, on a production basis of 100 boilers a day, this method will effect a saving of $10,000 to $15,000 a year over the riveting method. Reasons given for this economy are the simplification of the construction process, eliminating punching and rivet-



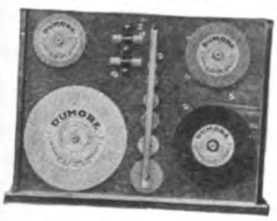
ing, the increase of production over the same period with less help, and the large reduction in defects.

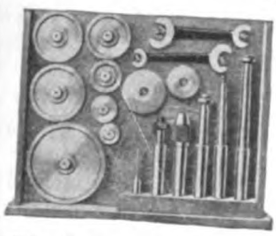
The equipments for both longitudinal and circular seam welding are made up of the same standard units as are used with other automatic arc welding equipment.

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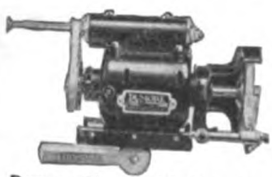


No. 3 - Grinder





Wheel & Spindle Equipment Furnished with Dumore No. 3 Multi-Speed Grinder



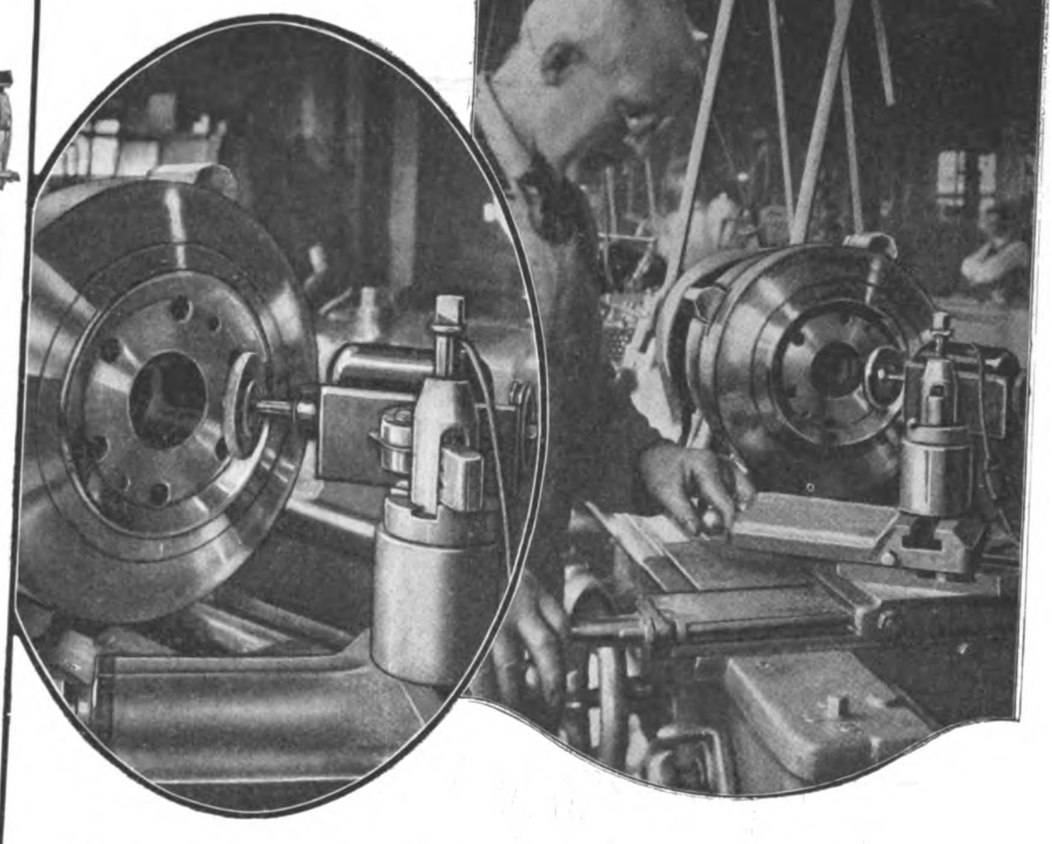
Dumore No. 2^{1}/$_{2}$—AG Grinder

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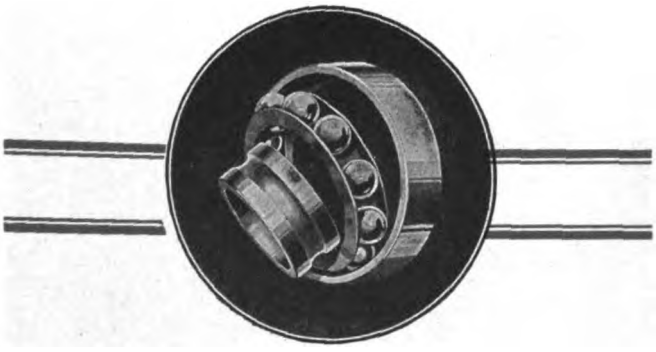
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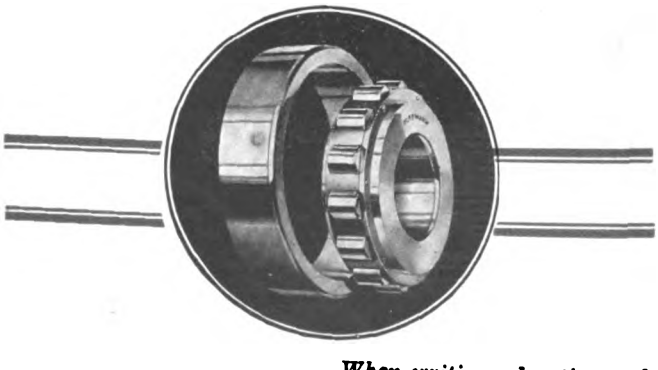
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Put them in your machines—**"Norma"** Ball Bearings or **"Hoffmann"** Roller Bearings—and you'll be protected absolutely against improper or neglected lubrication. You'll add to the life of your machines, increase their production, lower your costs, save power. In considering this proved form of insurance, our engineers will gladly help you with their long and specialized experience—without obligation.

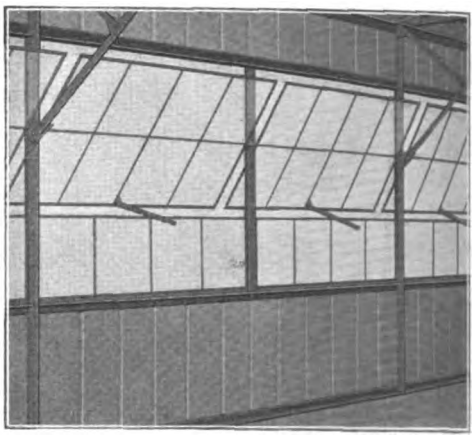
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Shops, warehouses, boiler rooms, foundries and machine shops are now being made from Martin Standard Buildings.

Assembled easily, they are made of steel and can be used for years with very little maintenance.

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Leading firms everywhere are supplying Davenport Wood Sole Shoes to their men. They protect their feet from water, oil, acid, dust and dirt.

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Davenport Wood Sole Shoes are made in various qualities and in all sizes. Boots may be had if desired. Write for Booklet and Price List or order samples on approval.

F. J. Stahmer Shoe Company

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Davenport Wood Sole Shoes

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How to Keep Your Buildings Fit

The suggestions for reducing maintenance costs made on this page represent the experience of hundreds of well-known industrial concerns. A few are named below.

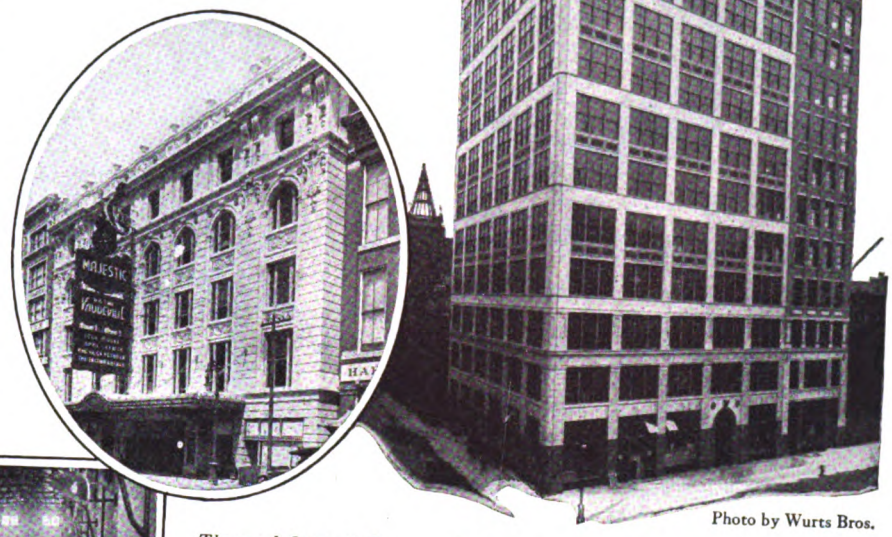


Photo by Wurts Bros.

The wood floors of the Majestic Theatre, Dallas, Texas, (above) will not rot, splinter or dry out, for they have been treated with Lignophol, the preservative dressing that penetrates the wood, restoring its natural oil and gums.

The concrete floors of the International Tailoring Company Building (above) at 12th Street and Fourth Ave., New York City, will never dust or wear though the floors are under heavy traffic. In 1921 the floors and stairs were treated with Lapidolith, the liquid chemical floor hardener.

FLOORS—An ordinary concrete floor is much like a piece of sandpaper. Under heavy traffic it quickly dusts and wears.

Yet it is a simple matter to make a concrete floor both dustproof and wearproof. All that is needed is an application of Lapidolith, the liquid chemical floor hardener.

Lapidolith is flushed on the floor like water. It penetrates the porous cement, binds the loose particles together and fills up the voids. It hydrates the free lime, changing the porous structure by chemical action to a dense flint-like substance. A fine, even, close-grained surface of crystalline formation is the result. This surface resists the hardest kind of service indefinitely, without showing the slightest signs of dusting or wearing. Lapidolith is easy to apply. It goes on either a new floor or an old one, and a surface treated at night is ready for business by morning.



The cheery interior of the Wateree Power Company's Plant at Lugoff, S. C., (above) is painted with Cemcoat. Note that the paint is applied over brick. Cemcoat adheres to brick or concrete just as well as to wood.

If your floors are of wood, you can do away with floor oils and at the same time prevent the wood from splintering, rotting or drying out. A treatment with Lignophol will do the trick. This preservative dressing penetrates the wood, restoring its natural gum and oil. One treatment lasts for years, giving a hard, smooth sanitary surface.

PAINTED SURFACES—Water is a great deal cheaper material than paint with which to brighten up walls. If your interiors are painted with Cemcoat, you can make them look like new simply by the application of water and a little soap. Cemcoat is a gloss, eggshell or flat enamel paint that stays white long after other paints turn yellow. It can be washed again and again without losing that whiteness. And because of its body it usually requires one less coat for a given surface. Cemcoat is especially suitable for a brick or concrete wall, because it is not affected by free lime that is usually found in such a wall. Made for exteriors as well as interiors in white and colors.

ROOFS—If you have an old worn roof just brush on a coat of Stormtight, the thick, elastic, adhesive semi-liquid, and you will have a tight new surface at low cost. If you covered your entire roof with a thin sheet of rubber it could be no more watertight. Only, the sun would soon rot rubber, while Stormtight lasts for many years. Again and again it has saved plant owners the expense of laying a new roof.

Not only that but it will stop a small leak quickly and permanently, and often one tiny leak can cause a lot of damage. Stormtight can be applied by anyone over any roofing material. It is made in semi-liquid and plastic form, and is packed in containers holding anywhere from one gallon to a barrel.

EXTERIOR WALLS—Does the interior of your plant become damp in wet weather? Does water seep through the walls whenever it rains hard? Then you should apply Hydrocide Colorless to the outside of your building. This perfect waterproofing material penetrates the brick. It contains no paraffin and so does not run in hot weather; collects no dust; it can be painted very easily; and best of all, its presence cannot be detected on a wall. If you would have warm dry interiors and preserve the natural beauty of your walls, apply Hydrocide Colorless.

For years the leading industrial plants of this country—such plants as Ford Motor, Standard Oil, Bethlehem Steel, Swift & Company—have kept down their maintenance costs by using some or all of the above products. It will pay you to know more about these products. Sign the coupon below and return it to us today for free sample and complete information.

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Please send me, without any obligation, demonstration sample and literature on:— Lapidolith . . . . ; Lignophol . . . ; Cemcoat . . . ; Hydrocide Colorless. . . ; Stormtight. . . . . Check those products that interest you most.

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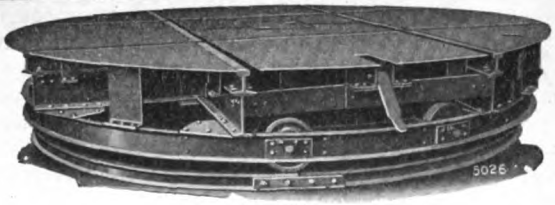


Fig. 5026

EASTON TURNTABLES

Structural Steel Type

There is a constant demand for special turntables to handle unusual loads or for special purposes for which the standard turntable will not answer.

We build these special turntables in any diameter, having built several of 24′ to 36′ diameter to handle one man street cars. Some have been made up to 80 or 100 ton capacity to handle transformers.

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EASTON CARS

FOR EVERY INDUSTRIAL PURPOSE

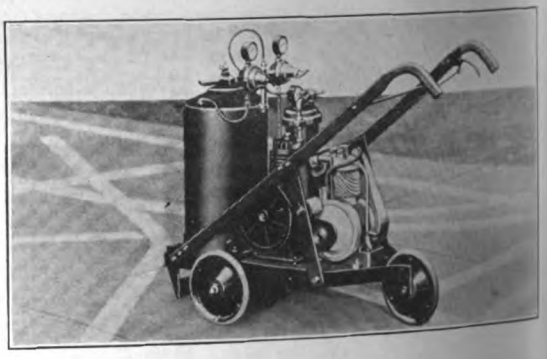
with the exception of the framework for holding the tanks. This framework is especially adapted to the work in question. The machine for welding longitudinal seams is especially designed to facilitate rapid and easy production, a pneumatic clamping device operated by a small lever gripping or releasing the work automatically. Both machines are arranged for pushbutton control within easy reach of the operators. The machine for circular welding revolves automatically while both ends are being welded.

The cycle of operation is simple. The sheet metal from which the tank proper is constructed is rolled the same as for riveting, tack welded in two places and then inserted into the longitudinal welding machine where the seam is automatically completed. The tank is then placed on the circular welding machine, where the heads and bottoms are both welded at once. Specially trained employees or experienced welders are not needed for the operation of the welding machines; any good workman can be trained for the purpose. A hand welder is usually employed, however, for tacking and sometimes for welding "spuds," or inlet and outlet nipples.

A Useful Floor Marking Machine

DESIGNED for marking sharply-defined lines on floors, streets, tennis courts, etc., this marking machine is finding increasing use in industrial plants for marking trucking aisles and the like.

The apparatus is mounted on rubber tired, roller bearing wheels for ease in handling, and is readily controlled; making it easy to mark curves and angles. The manufacturers, the Simons Paint Spray Brush Co., of Dayton, Ohio, claim that this machine will produce a clean-cut line, three to six inches wide, and will operate as fast as a man can walk.



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Dumping in Cars, Easy Discharge

Bulk Material Handling Trailers or Skids

"V" Dump Bodies on Trailers, as shown in the illustrations, or bodies on skids —either for side or rear dump—offer an economical means for handling bulk materials, waste or scrap —in foundries and various industries.

Many companies set trailers or skids at suitable places throughout their plant to remove waste as it accumulates, and trucks or tractors at intervals during the day make collections.

These are standard units for delivery from stock—1-yd. and 1½-yd. sizes.

Have you our booklet—"Snap Shots of Sensible Savings"? Send for it.

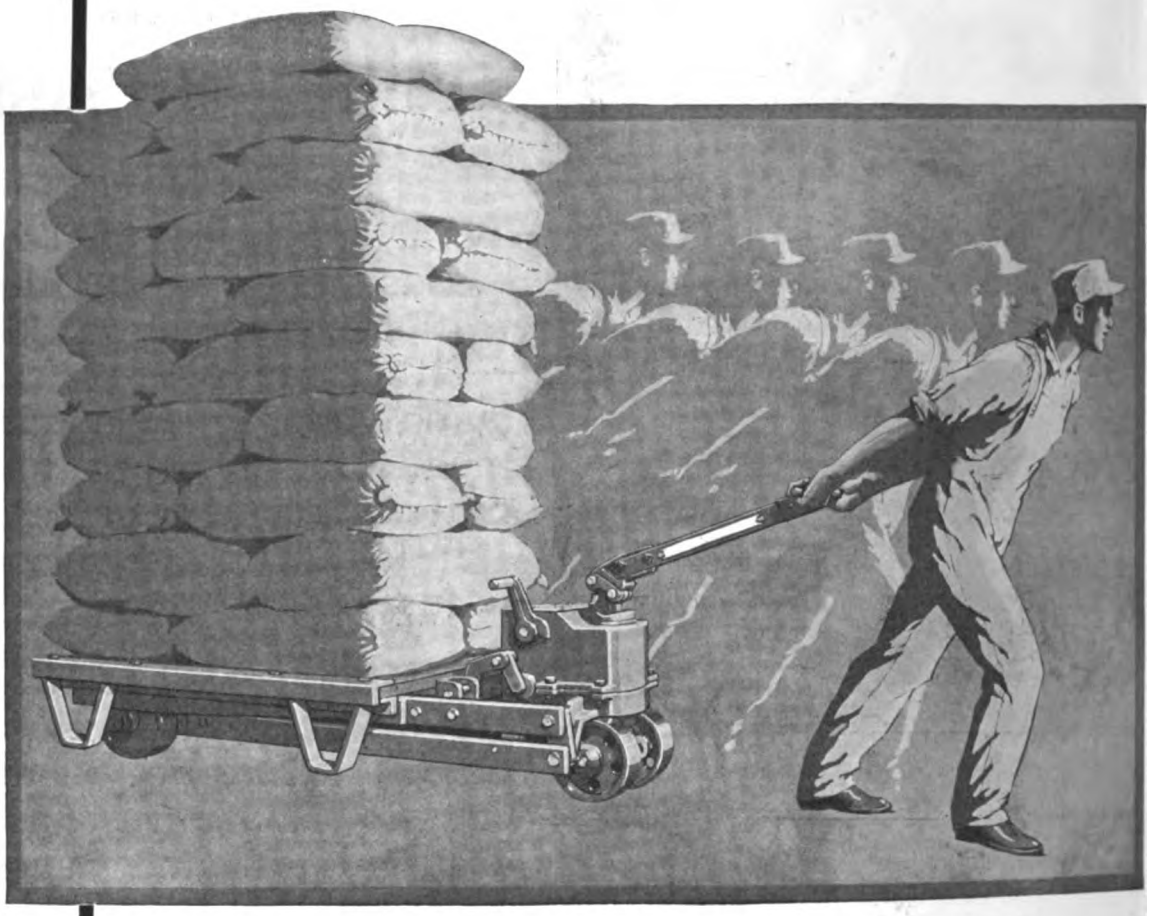
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Stuebing Steel-Bound Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble

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Not a new question, but was there ever a time when its answer was of such supreme importance?

Increasing loads, not men, saves nearly $6,000.00 annually for a large confectioner with Stuebing Lift-trucks.

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$24,900.00 for Chicago Mill & Lumber Company,—

are examples of the value of lift-truck savings—of multiplying men—savings big enough to warrant serious, close, personal attention to its possibilities for you, making it possible for a trucker to handle four times as much material per trip with less effort than he now expends—automatically builds profits.

D Model

Here is a truck that's application is almost universal. Simple—powerful—dependable—all steel, even to the wheels. Its capacity for work is almost immeasurable. National Screw Machine Company have just retired a D Model from service that has carried two hundred and twenty-four million pounds of material during its life. Over 50,000 Stuebing units in use, and there are infinitely more manufacturers using them than any other type or make. If your loads do not exceed 4,000 pounds, the D Model will serve your purpose longer at a lower cost, regardless of what your work is.

K Model

For from four to six thousand pounds or congested conditions, this unit out-performs all others. Delco just purchased twelve of a potential fleet of seventy-two. Johns-Manville, General Electric, Chevrolet, scores of those who appreciate values, standardize on them exclusively. It lifts from all angles, is quipped with Timken and Hyatt bearings, is of all-steel construction, and is the only truck built with the lifting mechanism enclosed, against damage. Furthermore, a 66 to 1 lifting ratio enables truckers to handle gigantic weights single-handed.

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Place any Stuebing product in competition with any other and the difference is immediately apparent. No scrimping of stock—no freak designs to befuddle—no makeshift departure from good machine tool practice in order to maintain high profits at low prices. Sixty-odd thousand Stuebing trucks in use daily attest undeniably the superior merits of the product.

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LIFT TRUCK SYSTEMS

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A New Truck Body with Rolling Bottom

By William Greaves

THIS new handling device known as the Labride Roll-Out body will fill a much needed requirement in the handling of materials to and from the truck body. It will indeed prove a boon to the trucker in the handling, both in unloading and loading, piece by piece of such materials as boxes, bags, barrels, brick, cement blocks, ice, etc. With this new type of truck body one man does the work of two in less time and with less effort. No climbing up in the body to get the contents, and damage to goods is reduced to a minimum due to the small amount of handling involved.



Fig. 1. Placing the first tier load on the truck.

This new type of body is substantially constructed of rolled steel shapes and sheet steel. The bottom consists of a flexible steel apron constructed of rolled steel bars, crimped to afford lightness, tightness and strength.

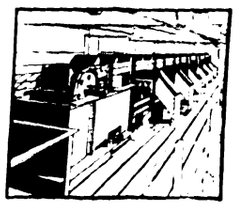


Fig. 2. The truck completely loaded. Directly under the tailboard can be seen the sprockets which move the bottom.

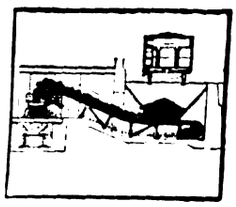
These are connected together with steel roller chains which pass around sprockets at the rear of the body and return under same. By turning gearing, engaging

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OUT went high cost coal handling



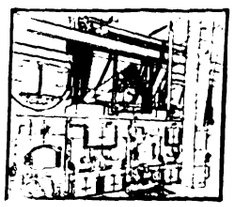
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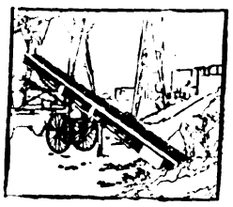
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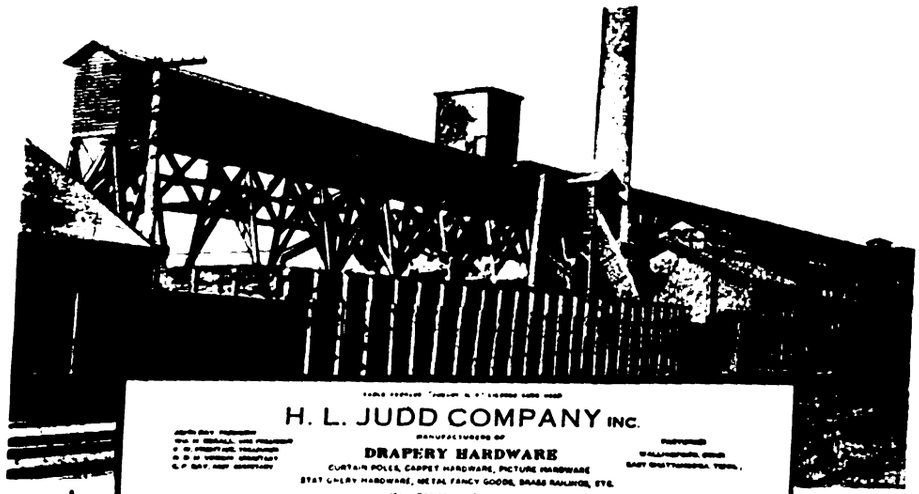
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Effects large savings

While we have no exact figures on this proposition, we are confident it has effected a large saving in the handling of our fuel, and a rough estimate would indicate that it has more than paid for the original cost of installation. We unload four and five cars a day, with four men—two in the car and two breaking up lumps as they fall in the grating.

Operating and maintenance expense small

The amount of current we use is not large and the repairs have been very moderate. Very pleased to recommend this to any of your customers should such endorsement be desired.

Yours truly,
H. L. JUDD CO., INC.,

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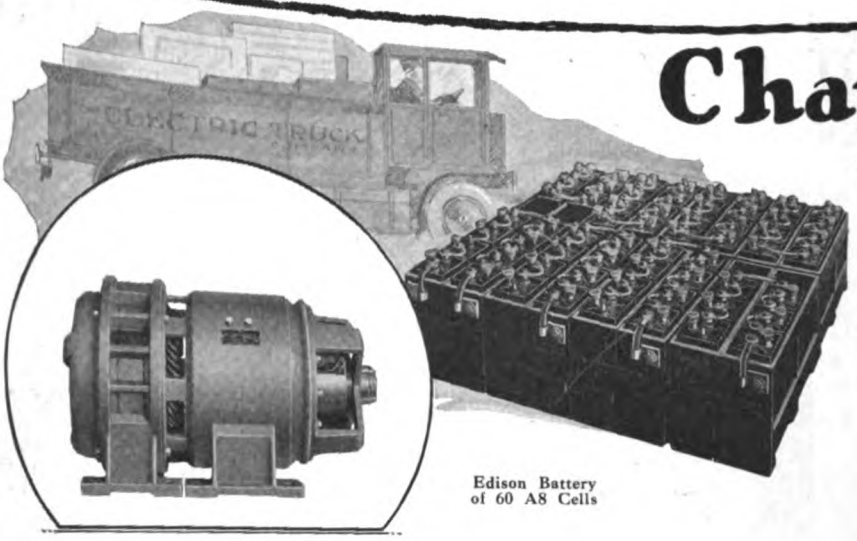
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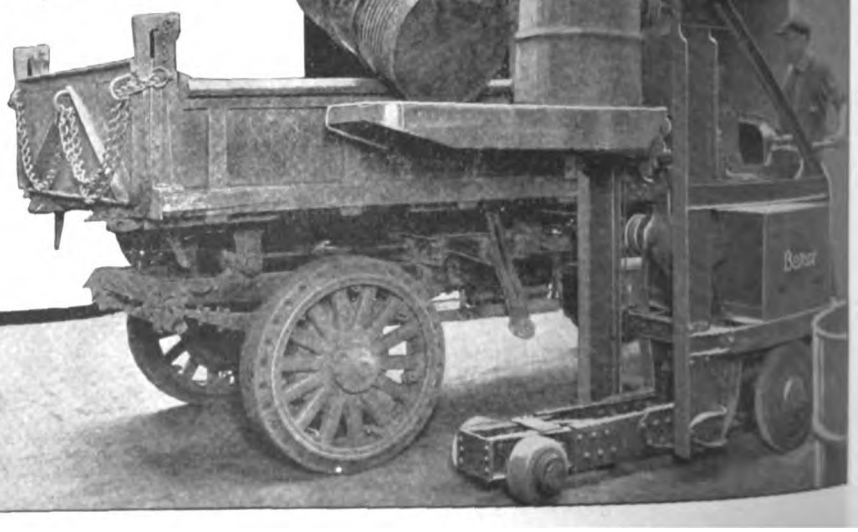
ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.

Baker

Solving Industry's Transportation Problems

THERE is a Baker tractor, truck or crane for every material-handling service. The Compton and Knowles Loom Works, for instance, uses Baker elevating trucks for transporting parts in skids, Baker Hy-Lift trucks for tiering and Baker Crane Trucks for handling assembled machines.

THE BAKER R & L COMPANY
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the sprockets the body bottom is rolled forward and backward, bringing the load toward or taking it from the operator as desired.

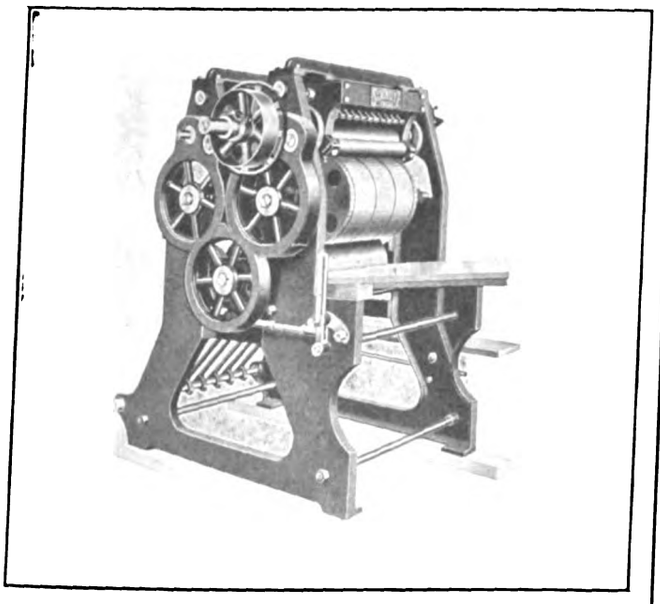
In loading, the bottom is rolled back by turning the crank until the front bulkhead is near the back end of the body (See Fig. 1). A tier of material the full width and height of the desired load is placed against the bulkhead and the bottom rolled forward a foot or two, by revolving the crank. Another tier of material is then loaded and the operation repeated until the truck is loaded and the bulkhead is up against the cab. In unloading the operation is reversed. The entire operation is accomplished by one man standing on the ground.

For unloading bulk materials such as coal, and those granular materials like sand, gravel, etc., requiring control of the quantities discharged this same body can be used, and for unloading cinders, or gravel and stone in repairing roads, where an even spread is desired its use will be found to be a big labor and time saver.

As this body is hand operated it can easily be attached to the truck, can even be placed on a trailer or semi-trailer. It is especially adapted to cover delivery trucks where climbing into the body after the load is unusually inconvenient.

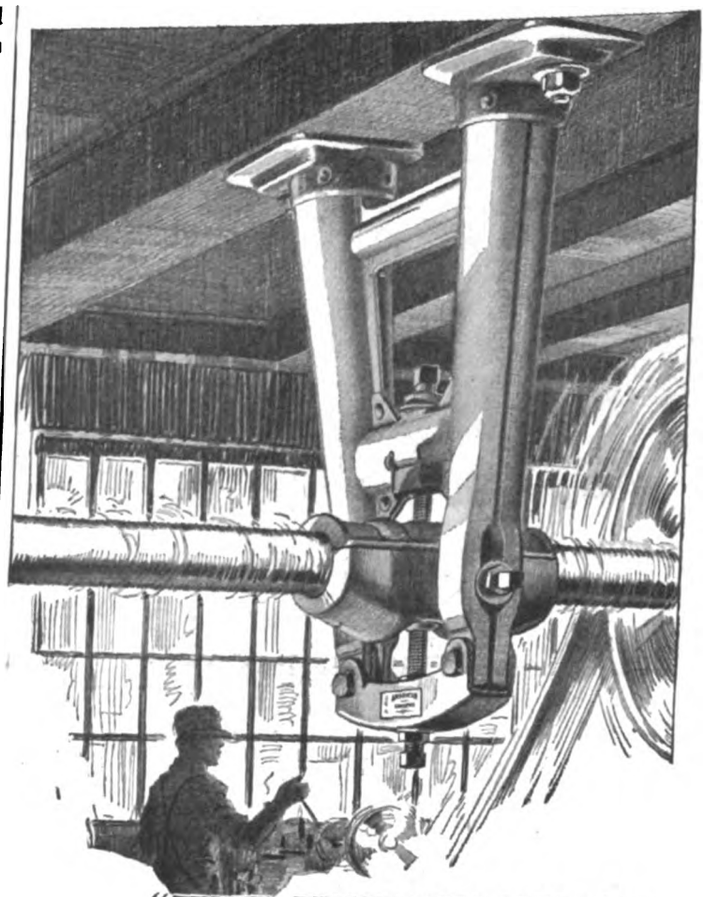
Erratum Notice

ON page 46 of INDUSTRY ILLUSTRATED for August, this year, appeared a description of a new bag-printing machine made by Schmutz Manufacturing Company, of Louisville, Ky. Accompanying the description



was an illustration purporting to be the machine in question. The manufacturers call our attention to the fact that the illustration showed, instead, a special machine of their manufacture, designed for the printing of iron, steel and galvanized sheets.

We are glad, therefore, to present here the correct illustration of the bag printing machine, which is made either in single-color or (as shown here) in two-color printing models.



"THE FINEST PIECE OF METAL STAMPING I EVER SAW"

THIS was the initial remark of an industrial engineer after he had looked over his first American Pressed Steel Shaft Hanger.

Then, as he carefully examined in detail the construction of the hanger, he noted the design, the unusual strength and rigidity against vibration; the smooth, round surfaces, without dust pockets, that make for cleanliness; absence of projecting parts that assures safety; the provisions for quick and accurate adjustments and the graceful lines that contribute to the appearance of any shop which is equipped with American Pressed Steel Hangers.

Not only is the American Pressed Steel Shaft Hanger an example of fine, accurate metal stamping, but it embodies all the engineering principles that assure satisfactory performance.



THE American Steel Split Pulley is used in every country where manufacture is an important industry.

An interestingly illustrated folder fully describes this hanger. Send for your copy.

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers and Pressed Steel Shapes

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THE day they moved the well into the kitchen and threw the pump away, the use of water trebled. As soon as a power drill took up the back-breaking labor of abrading a hole through metal, holes multiplied, machines grew, and metal working began to assume the proportions of an industry.

Today still better drills increase the productivity of machines, shops, industries.

Firms that would stand at the head choose Cle-Forge because they know its world's records in cast iron and machinery steel assure efficiency in meeting the ordinary requirements of the day.

CLE-FORGE drills are carried in stock by the "Cleveland" distributor in your city. Remember it's the drill that "tells its own story".

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK CHICAGO LONDON





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Installation of standard Medart steel shelving in the Machine Shop of a large Eastern Railroad.

One Way to Cut Your Overhead

Industrial rentals are figured on a square-foot basis, no account being taken of the stack of cubic feet above each square foot. Steel shelving converts these valuable cubic feet into convenient storage space and thereby saves much costly floor space for the more profitable work of actual production.

MEDART Steel Shelving

is readily adaptable to the storage of any commodities regardless of their size or weight. Simple to erect—easy to move or rearrange—the ideal storage equipment for stock room, tool room or parts department. Let us send you Catalog S-7 which describes Medart Steel Shelving in detail.

MEDART Steel Lockers



are furnished in a complete variety of types and are readily adaptable to any use or arrangement. Completely illustrated and described in Catalog A-13.

Standard finish on Medart steel products is two coat baked-on olive green or French gray. Grained mahogany or walnut supplied on special orders.

FRED MEDART MFG. CO.

Potomac and De Kalb Sts. St. Louis, Mo.

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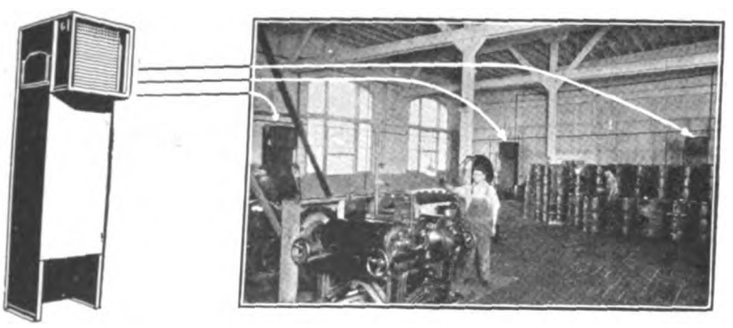
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METHOD OF HEATING

RESULTS never before dreamed of have been achieved with the Venturafin Method of Heating. One tenth the weight of direct radiation! One fourth the space of ordinary radiators! The ability to heat up quickly in the morning! Complete distribution and easy control of heat! Tremendous heating efficiency and lower first cost, lower installation cost, and lower operating cost.

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Send for our catalog and complete details of the Venturafin Method of Heating. Learn the many benefits, advantages and economies of the Venturafin Method of Heating before you buy any heating equipment. The coupon will bring all the facts to you post-paid and by return mail.

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Canadian Sirocco Company, Limited, Windsor, Ontario

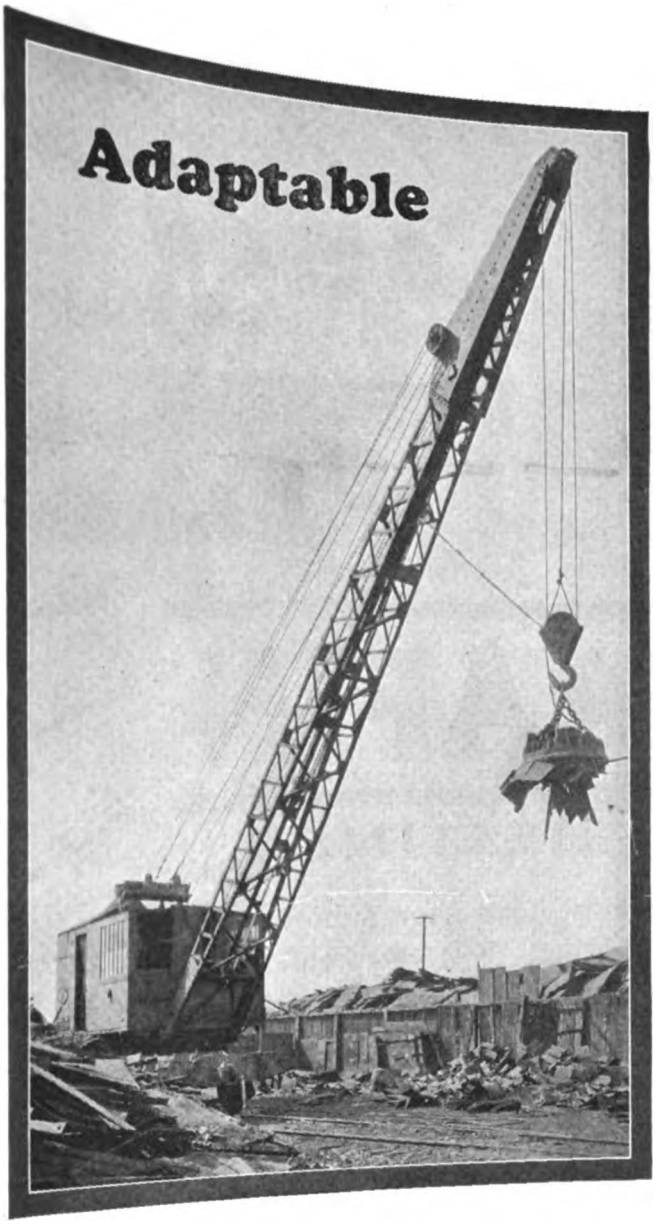
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Manufacturers of all Types of Air-Handling Equipment — Since 1881

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McMyler-Interstate locomotive cranes are widely used in industrial plants because of their adaptability to many different kinds of service. For handling iron and steel with an electro magnet, for unloading and reclaiming coal, for handling bulky waste products and for many other duties, these cranes are proving economical and dependable. Sizes range from 10 to 50 tons. May we tell you more about them?

Car Dumpers • Coal Handling Machinery • Clam-shell Buckets

McMyler-Interstate

New York • Chicago Cleveland Buffalo • Philadelphia
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A Door-Closing Rig for Truckers

By John Henderson

IN a number of industrial plants the cost of heating is high, mainly due to the amount of heat wasted by leaving doors open. If any amount of trucking is being done this appears to be a necessity, as truckers object to stopping for the opening and closing of doors. It has always been a problem to overcome this tendency and in a number of instances the practice still continues.

The writer has seen this problem solved quite satisfactorily by the installation of an automatic door opener and closer as illustrated in Figs. 1 and 2. This equipment is an adaptation of the trolley car door opener and can be easily installed in any plant where air is available for operation.

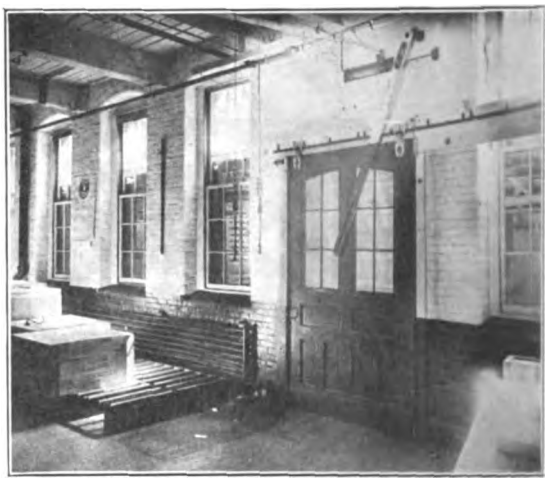


Fig. 1. Door closed showing complete working mechanism.

Fig. 1 shows the complete installation and also the *open* and *shut* control cords, which are located on both sides of the door. With this device the trucker, whether he be with a hand or electric truck, simply pulls the cord to open, and after passing through pulls the cord to shut. By having the cord arrangement it is not necessary for the trucker to go out of his way to operate the door.

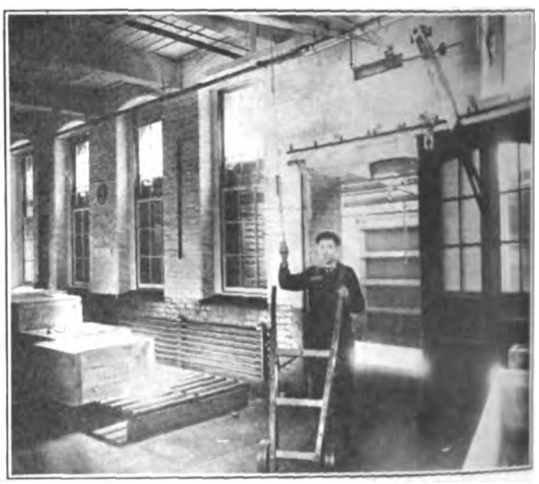


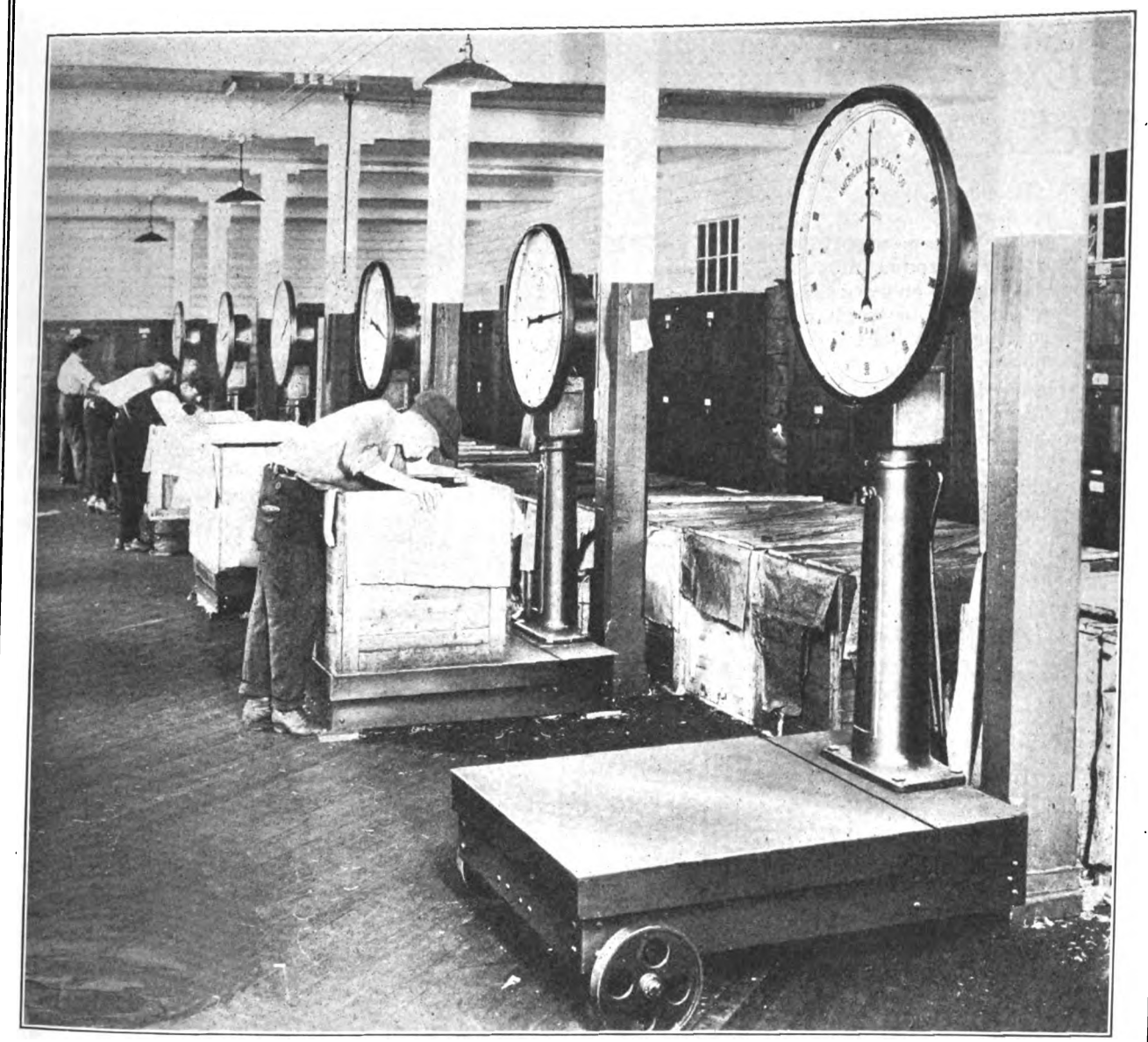
Fig. 2. Door open and trucker pulling control cord to shut.

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November, 1925

KRON SCALES

Weigh it While You Move



Fifty KRON SCALES expedite the shipping of finished products in this plant, because no time is lost in weighing.

The empty boxes are placed on the scales and as soon as they are loaded sufficiently the weights are shown on the dials. Another example of **Load and Look.**

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams —no springs. Simply load and look.

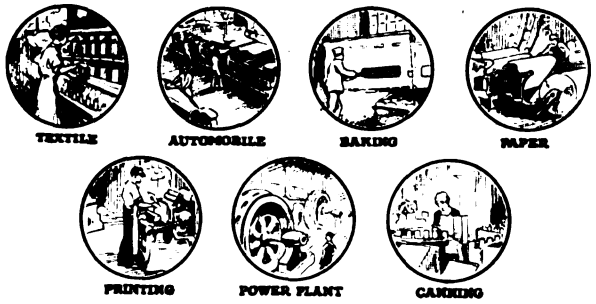
Write for a copy of our 62 page catalog describing all the various types.

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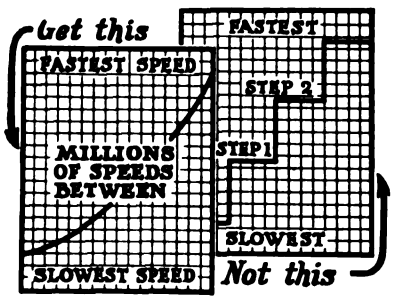
Every Industry Backs *Your* Choice!

THE same method of speed control which has proved the best in your industry, is the leader in every industry. The experiences of progressive manufacturers everywhere have proved that there is only one method which insures *accurate* flexibility of speeds on their machines and conveyors—the REEVES Variable Speed Transmission.

Steps in speed that are just *near to* the speeds you want are not *exact* enough for best results. Often the exact speed you need is *between the steps*, and the REEVES Transmission is the only way of getting the "in-between" speeds accurately.

Let us tell you about the REEVES Transmission in your industry, and the leading manufacturers who use it. Write today for Catalog L-44 and full information.

Millions of Speeds at Your Command!



With the REEVES Transmission you get literally *millions of speeds*—not just *steps* in speed—but *any* speed between fastest and slowest. The REEVES Transmission will hold any speed indefinitely, or may be changed instantly to meet any different operating condition. Easy to install—simple to operate—pays for itself in a short time—lasts for years. Accurate and dependable, always.

See Us at the New York Power Show, Space 60-A, Nov. 30th to Dec. 5th.

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REEVES
Variable Speed Transmission

Mercury Builds an Inspection Car

THE need expressed by many of the large industries which operate industrial tractors and trailer systems for a trailer equipped with seats to provide a convenient vehicle for carrying visitors or permitting plant inspection by the executive officers has been met in the new passenger type trailer manufactured by the Mercury Mfg. Co., 4118 So. Halsted St., Chicago.



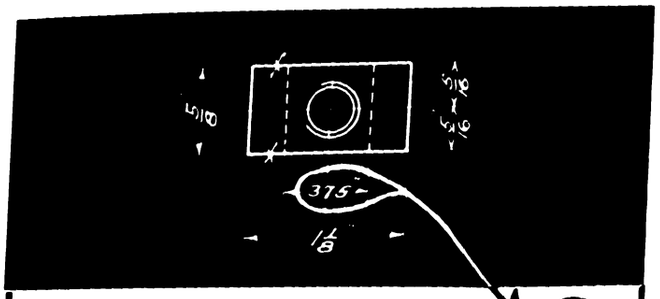
This trailer or inspection car is mounted on regular Mercury A-310 all steel trailer chassis, the wheels being equipped with rubber tires and the trailers being provided with four comfortable leather top seat chairs.



The trailer is attached either directly to tractor or attached behind a trailer train, and permits of carrying four men comfortably through a complete tour of plant inspection.

Trailers of this type are now in use in the packing houses of the Chicago stockyards for the convenience of visitors and can be used even to the extent of a complete train of similar trailers to carry a large number of guests through a plant at one time.

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Does Your Production Department Use Blurred Blueprints of This Kind?

A poor blueprint is expensive not only in the delay caused by illegibility but in the waste caused by mistakes.

Paragon made blueprints will eliminate these mistakes by reproducing every line of the original drawing clearly —yet Paragon prints are most economical to produce.

Years of scientific study and experiment are behind the modern Paragon equipment that operates so rapidly—but economically—and produces sharp, clear, strong and lasting blueprints.

Through the studied arrangement of powerful Paragon arc lamps, a maximum yet uniform concentration of light enables the operator to produce perfect prints quickly. Paragon prints are made—washed, dried, ironed smooth and flat—ready to use in 4 minutes.

But—the greatest achievement of all is our ability to produce this equipment for sale at a reasonable price.

Illustrated Catalogue free on request.

Paragon Machine Co. Rochester, N. Y.

PARAGON BLUE PRINTING EQUIPMENT



The real cost of paint is the cost of painting

IT'S a lot cheaper to use paint that lasts; a coat of Nitrose outlasts ordinary paint by at least two or three times, which means that the cost of the painter's time is saved.

Let us send you a man who knows the cost of paint and the cost of painting—he can point out a big saving for you. Or shall we send the descriptive bulletins?

The Nitrose Company
Peoria Life Bldg.
Peoria, Ill.

NITROSE

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As Good as the Company They Keep

Makers of good articles are always proud of them; they spare no pains to maintain their manufacturing reputation—the best is never too good for them to use in their product.

That's why you'll find Jacobs Chucks used as standard equipment on no less than 132 different makes of drilling machines and portable drills. These manufacturers make their machines as excellent as they know how and finish their work by using the best chuck they can find on the market.

Their machines produce more holes with Jacobs Chucks—more and better holes. And drill breakage is reduced to an absolute minimum, thus answering the insistent call for greater production.

Your dealer has Jacobs Chucks—try them. You'll be convinced.

THE JACOBS MANUFACTURING CO.
HARTFORD, CONN.
The World's Largest Producers of "Drill Chucks"

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Electrical Protective Devices

A loose-leaf catalog containing price lists, and bulletins illustrating and describing Condit Electrical Protective Devices, has been issued by the Condit Electrical Mfg. Co., of South Boston, Mass. Another piece of literature issued by this company is the Industrial Handbook No. 5005, which contains illustrations and description of Condit Safety Motor Starters, Circuit Breakers, etc.

Brush Making Machine and Special Machinery

Illustrated circulars describing the Toledo Automatic Brush Making Machine and a Machine for Grinding the millions of rollers used in Bock Bearings have been issued by the Kent-Owens Machine Co., 958 Wall St., Toledo, Ohio.

Stokers

"A Long Step Forward" is the title of a descriptive folder on Advance Stokers, which has been issued by the Advance Machinery and Supply Co., Railroad Bldg., Denver, Colo.

Filling Station Equipment

Several pieces of descriptive literature on Milwaukee Visible Pumps and Filling Station Equipment have been issued by the Milwaukee Tank Works, Milwaukee, Wis.

Paint Spray Brush

An illustrated booklet, containing 16 pages, which describes the Simons Paint Spray Brush, has been issued by the Simons Paint Spray Brush Co., 17 Maryland Ave., Dayton, Ohio.

Portable Air Tools

Hercules Portable Air Tools are illustrated and described in a booklet which has been issued by the Buckeye Portable Tool Co., 131 Wayne Ave., Dayton, Ohio.

Factory Truck Wheels

A 16-page illustrated booklet describing the Metzgar Factory Truck Wheels has been issued by the Metzgar Co., of Grand Rapids, Mich.

Call Paging System

Bulletin A-50 containing 16 pages of illustrations and description of the Signal Call Paging System has been issued by the Signal Engineering and Mfg. Co., of 533 Canal St., New York.

"Side-Dump" Stokers

A 20-page illustrated booklet which describes the Jones "Side-Dump" Stoker has been issued by the Riley Stoker Corp., Worcester, Mass. This publication, known as No. 90, includes illustrations of some installations of these stokers.

Car-Pullers

Bulletin No. 129 which illustrates and describes Mead-Morrison Car-Pullers has been issued by the Mead-Morrison Mfg. Co., of East Boston, Mass.

Centrifugal Pumps and Steam Turbines

are described in a small booklet which has been issued by the Dean Hill [illegible] Co., of Anderson, Ind.

Drinking Fountains, Washbowls and Steel Shelving and Racks

Three illustrated booklets describing Meeco Sanitary Drinking Fountains, Washbowls, and Steel Shelving and Racks, have been issued by the Manufacturing Equipment and Engineering Co., of Boston, Mass.

Lift Truck Platforms

Lewis-Shepard Lift Truck Platforms with Steel Legs are described in an illustrated folder issued by the Lewis-Shepard Co., of Boston, Mass.

Waterproofing and Dampproofing

Specifications for waterproofing, dampproofing and oilproofing have been published in Book "A" of a special series of books which are being published by the Truscon Laboratories, Detroit, Mich.

Turret Lathes

An illustrated catalog containing 48 pages of description of Warner & Swasey Turret Lathes and Brass Working Machine Tools has been issued by the Warner & Swasey Co., of Cleveland, Ohio. Another booklet issued by the company is entitled "Profits from Small Lot Production."

Phono-Electric Book

which contains 15 pages of technical data and tables, as well as pictures showing the installation of Phono-Electric trolley wire on railway lines throughout the country and also description of the new wire—Phono-Hi-Strength—has been issued by the Bridgeport Brass Co., of Bridgeport, Conn.

Underfeed Stokers

A 32-page illustrated bulletin describing the Detroit Single and Multiple Retort types of Stokers has been issued by the Detroit Stoker Co., Detroit, Mich. Installation photographs are also included in this booklet.

Sand and Gravel Handling Equipment Book

Book No. 540, containing 72 pages of illustrations and description of various types of screening, washing and handling equipment used in the preparation of sand and gravel, including photographs of typical installations operating under varied conditions, has been issued by the Link-Belt Co., Chicago, Ill.

"Regrinding of Machine Knives"

is the title of a booklet which has been written by Theo. Giles, of the Simonds Saw and Steel Co., and Charles A. Runo, of the Norton Co., and issued by the Norton Co., of Worcester, Mass.

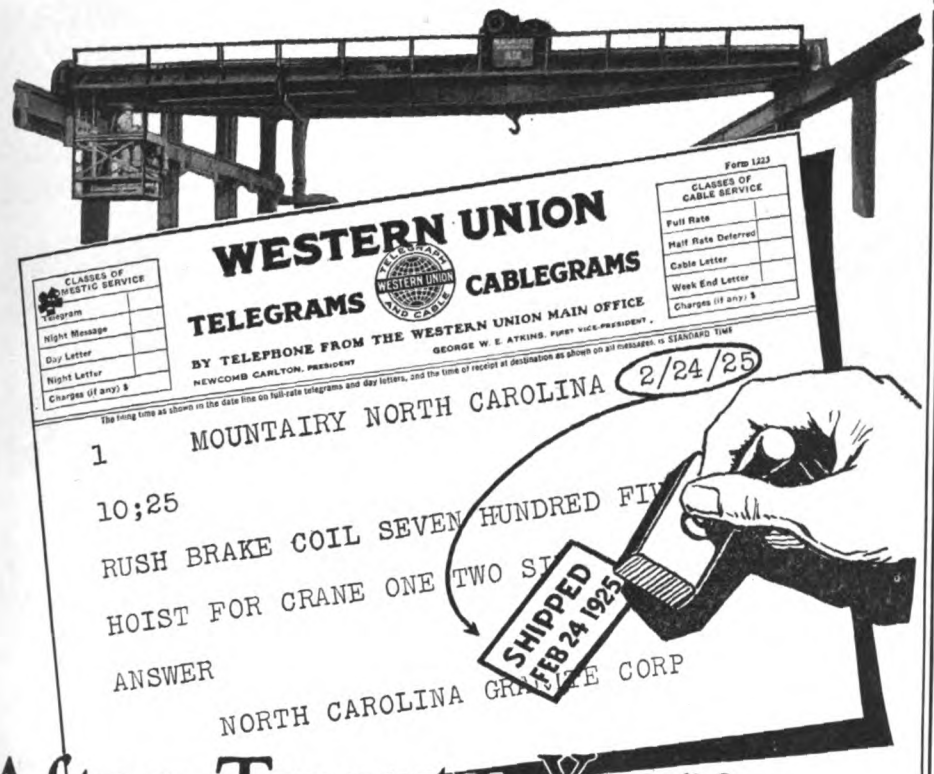
Locomotive Cranes and Grab Buckets

A 72-page catalog, No. 37, illustrating and describing O & S Material Handling Machinery, has been issued by the Orton & Steinbrenner Co., 608 So. Dearborn St., Chicago, Ill.

"Facts Concerning Electrical Conduit"

is the title of an illustrated folder which has been issued by the Youngstown Sheet and Tube Co., of Youngstown, Ohio. A large booklet also issued contains colored re-

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After Twenty Years— Twenty Hour Service!

THE North Carolina Granite Corporation of Mount Airy, N. C. recently wired for a repair part to serve a P & H crane which had given excellent service for twenty years. The part referred to was shipped the same day the telegram was received at the P & H office. After twenty years—twenty hour service. Mr. Martin, sec'y and treas., writes—

> "We received your telegram of yesterday the first thing this morning and are very much pleased that you were able to make such good time in getting the brake coil for our Crane No. 1260 shipped so promptly.
>
> This kind of service coupled with the performance of the two cranes that we have already bought from you makes us certain that when we buy the next one it will be one of yours."

It is not only our purpose to make P & H the most perfected and highly-efficient electric cranes to be had but also to back them with the most complete and prompt service.

HARNISCHFEGER CORPORATION
Successor to
PAWLING & HARNISCHFEGER CO.
Established in 1884
3850 National Avenue, Milwaukee, Wis.

New York	*Birmingham*	*Kansas City*	*Pittsburgh*	*Seattle*
Dallas	*San Francisco*	*Detroit*	*Memphis*	*Portland*
Philadelphia	*Chicago*	*Minneapolis*	*Los Angeles*	*Jacksonville*

A P & H Crane owner up in Northern Michigan took a chance on telephoning the P & H factory on a Sunday morning not so long ago—and fortunately gained 24 hours.



A replacement part on a much needed crane was required in a rush—the first part needed for a crane purchased 20 years previous and in service since then.



This crane owner was not told that the matter would be reported to the service department the next morning. Wishing to do his utmost the P & H man succeeded in getting in touch with one of the service department men, hurried him back to the plant and, although as mentioned above, this crane had been sold 20 years ago, the part was found available for immediate delivery.





Crating took but a few minutes and then it was rushed to the station, shipped—and received by customer the next day, Monday.

While this service happened to be somewhat spectacular—it does illustrate the spirit of the service department of the P & H organization. The long life, low maintenance costs, infrequency of delays and conscientious service when it is required, we know are appreciated because they mean low crane operating costs.

LAKE SHORE ENGINE WORKS
Marquette, Mich.

We wish to express our appreciation of the services rendered on Sunday by your officials in complying with our telephone request and making shipment on that date of the motor field coils for our crane. We appreciate this kind of service very much indeed, and it is a source of gratification to us to know that we purchased our cranes from a concern that will help us out in such emergencies.

(*Signed*) E. L. Pearce
Vice President

P&H CRANES and HOISTS

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productions of photographic views in works of the company.

Automatic Scales

Descriptive literature on the subject of Richardson Apron Feed Automatic Scales has been issued in the form of illustrated booklets by the Richardson Scale Co., of Passaic, N. J.

Self-feeding Loaders and Ditchers

are described in two booklets entitled "Loading and Storing in Building Supply Yards" and "Cutting Mains and Services with a Barber-Greene Trencher" which have been issued by the Barber-Greene Co., Aurora, Ill.

Locknuts

An illustrated folder including price list has been issued on the subject of Champion Wrench-Tight Unit Locknuts by the Champion Locknut Corp., of 30 Church St., New York.

Steel Cabinets and Lockers

Several pieces of descriptive literature on Durabilt Steel Cabinets and Steel Lockers for use in factories, offices, schools, etc., have been issued by the Durabilt Steel Locker Co., of Aurora, Ill.

Digging Bucket

The Fogarty Digging Bucket is illustrated and described in Bulletin No. 71, issued by the McMyler-Interstate Co., of Cleveland, Ohio.

Fulton-Diesel Engine

An illustrated folder describing the Type "J" Fulton-Diesel Engine has been issued by the Fulton Iron Works Co., of St. Louis, Mo.

Belt Contactor

The "U. G." Automatic Belt Contactor has been described in bulletin No. 268, which has been issued by T. B. Wood's Sons Co., Chambersburg, Pa.

Gloves, Mittens, Hand Pads, etc.

A 24-page illustrated booklet on the subject of Steel-Grip Gloves, Leggings, Aprons, Arm Protectors, etc., has been issued by the Industrial Gloves Corp., 1213 Fullerton Ave., Chicago, Ill.

Turbine Blowers

Bulletin No. 77, containing 32 pages of illustrations and description of Turbine Blowers, including data on the application of these to stokers and graphical presentation of their use for hand-fired boilers, has been issued by the L. J. Wing Mfg. Co., 352 West 13th St., New York.

Steel Products

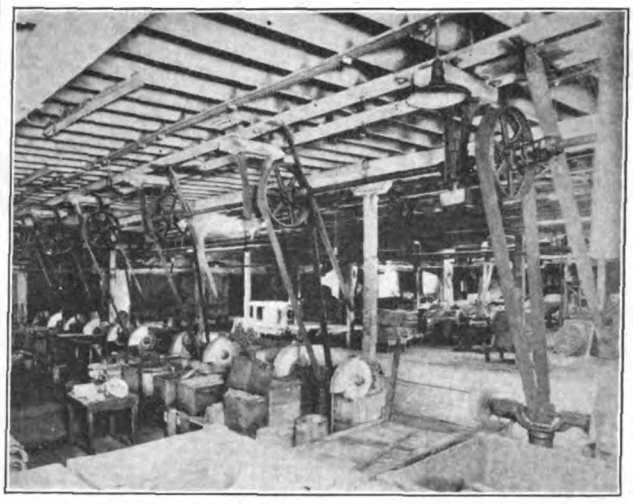
Three catalogs containing illustrations and descriptions of Lupton Pivoted Sash of copper steel, Lupton Casements of copper steel, and Lupton Steel Equipment, including storage shelving, display shelving, bench legs, tool cabinets, etc., respectively, have been issued by the David Lupton's Sons Co., of Philadelphia, Pa.

Automatic Equipment

for the control of newspaper and magazine printing presses and paper calendering machines are illustrated and described in Bulletin No. 108, which has been issued by the Monitor Controller Co., of Baltimore, Md.

Valves

A 48-page illustrated catalog, No. 32, describing Homestead Valves, which includes the Protected Seat

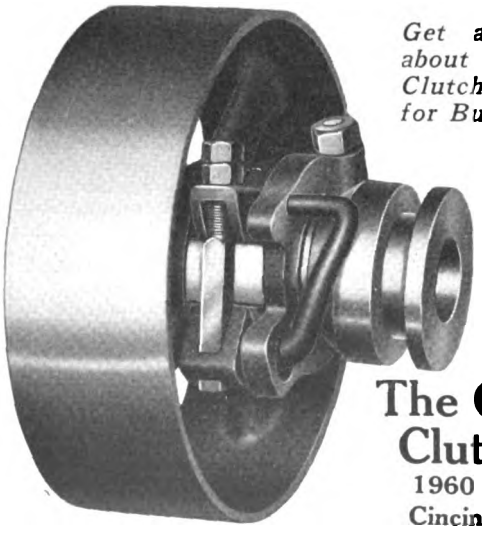


Each buffing lathe in this plant is driven with a Conway Clutch which has dispensed with all countershafts and

Saves 50% of Belting and Eliminates Loose Pulley Annoyances

The Conway Clutch gives you a greatly added assurance of maximum production, because it delivers the maximum power to belt, chain or gear train.

It engages easily—releases instantly—idles without drag—simple, fool proof in construction, and easy to erect and maintain. Only one point adjustment.

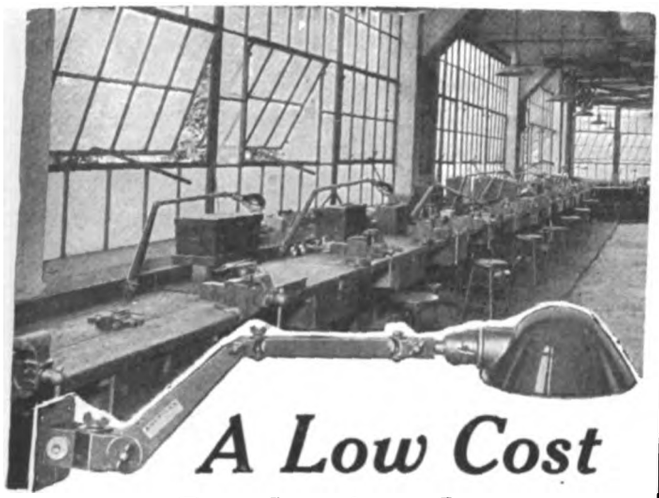


Get all the facts about the Conway Clutch. Simply ask for Bulletin 35.

The Conway Clutch Co.
1960 **Riverside**
Cincinnati, Ohio

Conway Clutches

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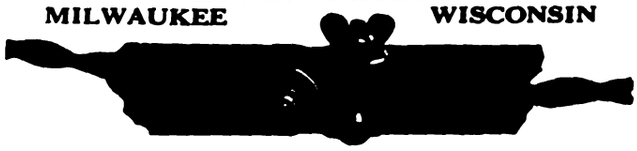
A Low Cost
Production Insurance

American fixtures universally adjustable to any position is the cheapest production insurance you can possibly buy. And they start to pay for themselves immediately.

The reflector used on American Fixtures is scientifically designed and diffuses a soft, steady, non-glaring light that is ideal for working conditions and suitable for accurate, difficult hand operations.

Six different types of fixtures to choose from. Write for illustrated catalog.

American Fixture Company
230 West Water Street
MILWAUKEE WISCONSIN

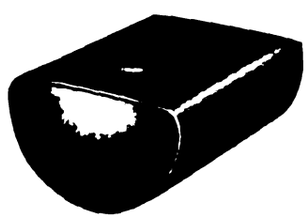


SHEET METAL COSTS ARE COMPETITIVE

This fact is true today to a pronounced degree. Roger Babson says business is settling down to a competitive fight over costs. How are you meeting this issue? We can be very helpful to you. Many of our customers have found that we can save them quite a bit in comparison with their costs.

You have only to write us about your needs, sending also blue prints or pencil sketches—our engineers will help you.

STEEL, IRON, BRASS, COPPER, MONEL METAL



in work demanding

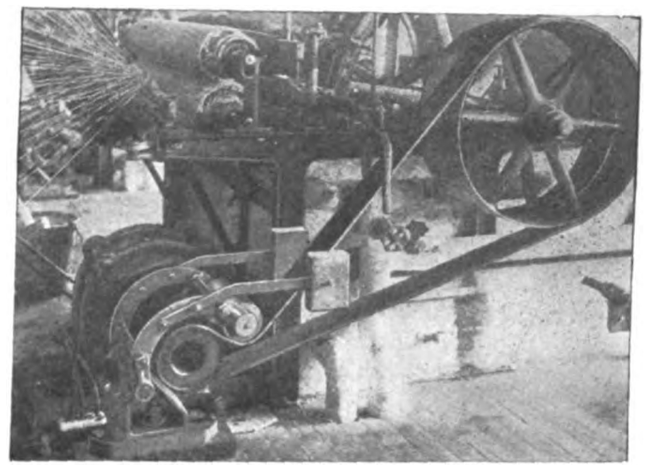
STAMPING—FORMING—DRAWING
BLANKING—PUNCHING

Uniformity of metal and accuracy of design guaranteed. Work of every kind solicited, up to and including 1/4 inch.

The Breese Bros. Co.
CINCINNATI, OHIO

See data 1924-25 A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks, Sweets Engineering and Thomas Catalogues.

THE LENIX DRIVE
(TRADE MARK REG.)



7½ H. P. Motor Driven Thread Dresser
Motor Pulley 5½" dia., 8" Face
Dresser Pulleys 21" dia., 4" face, Tight and Loose
Pulley Centers 3' 3"

The Lenix short Center Belt drive will be exhibited at the Power Show, Grand Central Palace, New York, Nov. 30th to Dec. 5, 1925, Booth 281 on the Mezzanine Floor.

There will be a visual demonstration, by the stroboscopic method, of the power lost through belt slip. This demonstration will be made with belt drives operating under conditions as nearly alike as it is humanly possible to make them.

All visiting the show are invited to Booth 281 to witness the demonstration.

The Lenix is not an idler. It is a "belt Wrapper" scientifically applied to belt drives for the purpose of eliminating belt slippage, saving floor space and increasing the general capacity of the drive.

Booklet "Saving Slippage & Space" will be mailed on request to those unable to attend the Power Show.

F. L. SMIDTH & CO.
Engineers
50 Church St. New York, N. Y.

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UNION
RENEWABLE FUSES

Instant Acceptance!



Never has there been such general acceptance and recognition of a device as was accorded the new and improved Union Renewable Fuse.

In less than a week after the initial announcements appeared, the number of orders showed conclusively that the extreme simplicity, substantial construction, and the other distinct advantages were appreciated by fuse users as well as the electrical trade.

Shipments are being rushed daily to all parts of the country. Production has been increased twice since the first schedules were planned.

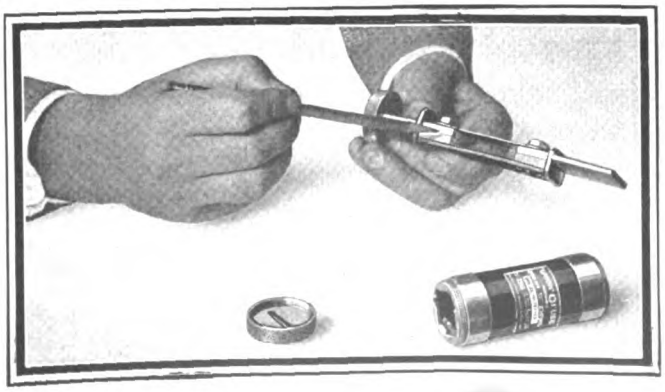
If you have not had an opportunity to see one of these fuses, ask your supply house to send you some when you place your next order. The fuse will tell its own story—take one apart—then you will understand why they reduce fuse maintenance costs to a minimum.

Pamphlet 101 contains complete information and prices on all Union Renewable Fuses. Copy on request.

CHICAGO FUSE MFG. CO.

MANUFACTURERS OF
ELECTRICAL PROTECTING MATERIALS AND CONDUIT FITTINGS
1515 West 15th Street
CHICAGO, ILL.

Note the straight-line construction and the heavy fibre bar that rigidly holds the knife blades in alignment



Globe, Angle, Check and Operating Valve—B. & O. Patents—has been issued by the Homestead Valve Mfg. Co., of Homestead, Pa.

Polyphase Induction Motors and Polishers and Grinders

A loose-leaf catalog has been issued containing illustrated bulletins describing the several types of motors manufactured by the American Electric Motors, Inc., Milwaukee, Wis.

Die Heads

A small illustrated booklet containing 93 pages, describing H & G Self-Opening Die Heads and an illustrated folder on the same product have been issued by the Eastern Machine Screw Corp., of New Haven, Conn.

Ventilators

Descriptive literature on the Arex-Austor and price lists covering the Arex and Economy Ventilators have been issued by the Arex Co., Conway Bldg., Chicago, Ill.

Air Brushes and Air Brush Guns

are described in several pieces of descriptive literature issued by the Willard C. Beach Air Brush Co., of Newark, N. J. One of these booklets is of loose leaf style containing photographs of the company's products with operating instructions. Another booklet is entitled "Pneumatic Painting Equipment Today."

Maag Gears

An illustrated catalog containing 20 pages and describing Maag Gears and Pinions has been issued by the Niles-Bement-Pond Co., 111 Broadway, New York.

Valve Control

Bulletin No. 103-29-B, which illustrates and describes Cory-Recony Standardized Unit Control for Motor Operation of Valves, has been issued by Chas. Cory & Son, Inc., of 183 Varick St., New York.

Fire Protection Apparatus and Snow Pushers

A 56-page illustrated booklet, containing descriptions and illustrations of Fire Protection Apparatus, which include Hose Carts, Racks, Reels and Cabinets, Extinguishers, Valves, etc., has been issued by the Wirt & Knox Mfg. Co., Sedgley Ave., Philadelphia, Pa.

Alloy Steel Castings

An illustrated booklet describing Sivyer Alloy Steel Castings has been issued by the Sivyer Steel Casting Co., of Milwaukee, Wis.

Air and Gas Scrubber

Bulletin No. 303, which illustrates and describes the E. M. Bassler Air and Gas Scrubber, has been issued by the D. J. Murray Mfg. Co., of Wausau, Wis.

Air Power Equipment

A 16-page bulletin, No. 126, contains illustrations and description of Sullivan Air Power Equipment for rock drilling, tearing up pavement, digging clay and in light hoisting tasks; several other bulletins illustrate and describe Sullivan Air Feed Stoping Drills, the "DW-64" Water Hammer Drill, "Rotator" Hammer Drills, Electric Portable Hoists, and Diamond Drills for Gas Engine Drive. This literature has been issued by the Sullivan Machinery Co., 122 So. Michigan Ave., Chicago, Ill.

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The Trackless Train



Mercury "A-310" Trailer

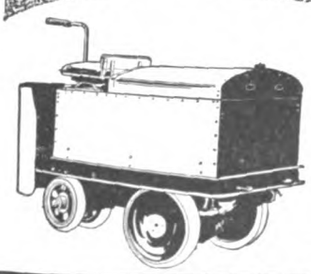
Low First Cost—or—Ultimate Economy

—If low **first** cost alone decides your purchase, we cannot expect your trailer order. *The Mercury "A-310" is not built to sell on price.*

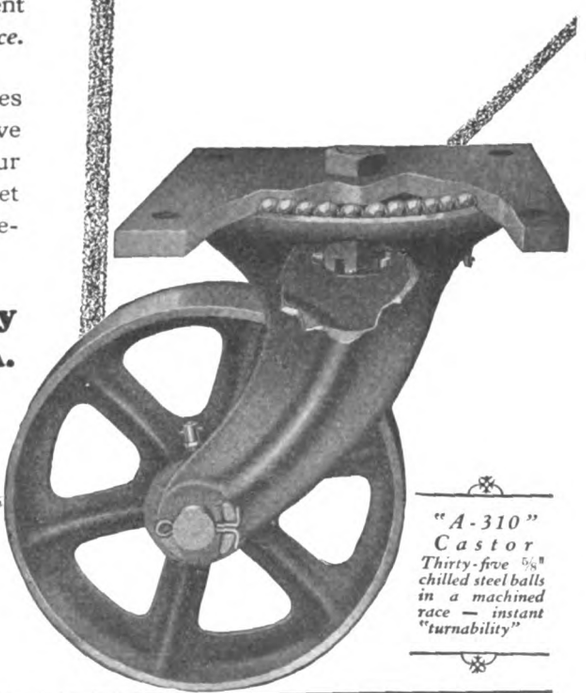
—but if Ultimate Economy, (brought about by elimination of maintenance, a positive guarantee of longevity, and maximum conservation of man and machine power) —is your controlling buying motive, we are confident that after investigation, *Mercury Trailers will be your choice.*

A strong statement, assuredly, and one that requires proof. Unfortunately space will not permit us to give the "reasons why" but they are all contained in our Bulletin A-100. Whether or not you are in the market for trailers you should have a copy for your files. Request one today.

Mercury Manufacturing Company
4112 So. Halsted St. Chicago, U. S. A.



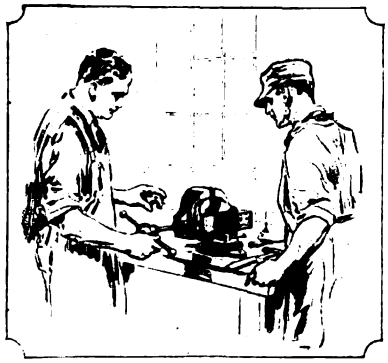
—and to pull the trailer
— there is the Mercury Tractor — offered in two distinct types and five different models (but that is a story in itself). Write for Tractor Bulletin 106.



"A-310" Castor
Thirty-five ⅝" chilled steel balls in a machined race — instant "turnability"

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6 Points of Extra Value At No Extra Cost

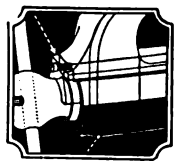


Here Are Two More

Last month's advertisement explained the superior construction of Parker Renewable Steel Jaws and the Parker Swivel Base. Here are two more Parker Features that give greater vise value at no additional cost.

Main Screw Easily Removed For Lubrication

A vise, like any machine, works better and lasts longer if it is properly lubricated. Lubricating the main screw on ordinary vises is a messy and unhandy job, and naturally it is often neglected. In Parker Vises proper lubrication of the screw is made easy. The saddle is on the *outside*. (See the accompanying drawing.) It is but a few minutes' work to take out the screw holding the collar, remove the main screw, as the man in the illustration is doing, lubricate it and replace it.



Solid Underportion

Putting the saddle on the outside, permits the underportion of Parker Vises to be cast solid, instead of hollow as in ordinary vises. This greatly strengthens the slide and the whole vise.

Parker Vises cost no more than ordinary vises. Let us send you our New Catalog No. 57B, showing all the Parker Features and the complete Parker line. Address, (Attention of W. R. B.)

The Charles Parker Company

Master Vise Makers

MERIDEN, CONN. U. S. A.

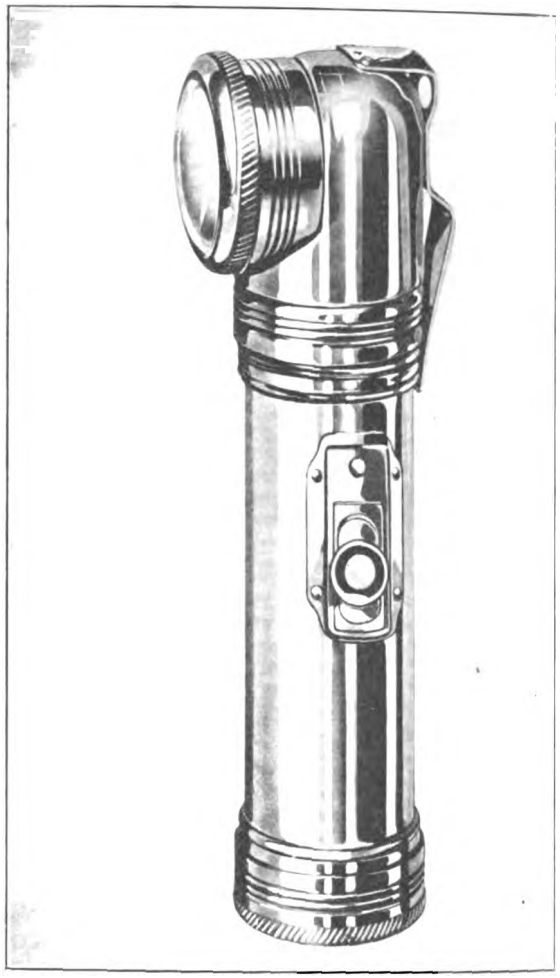
PARKER VISES

GRIP LIKE A GRIZZLY

"Industrial" Flashlight

A NEW type flashlight designed for the man who has to work in dark places and needs both hands free for the task to be done has just been placed on the market by the National Carbon Company.

The new light is called "Eveready Industrial, No. 2694." It is particularly adapted for use by linemen in



the employ of the public service corporations and large municipalities; for night repair gangs on roads, railroads, bridges and culverts, for maintenance gangs, for general repairmen in plants, and for the host of other occupations, where both hands must be free. The lens, being on one side, the flashlight can be stood on end and a beam of light cast at right angles to the erect case.

By means of a hook on the case, the flashlight can be fastened to a belt or the edge of a coat and the beam concentrated on the particular job to be done.

PROFITS of tire and rubber companies have been augmented this year by a heavy demand coupled with higher prices for the manufactured goods. Companies which were fortunate enough to have accumulated large inventories last year have benefited by the manifold appreciation in the price of crude rubber. But despite increases in tire prices, this same advance in the price of the basic raw material is a factor tending now to diminish profits.—*Alexander Hamilton Institute.*

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James Watt studying the power of steam from the tea-kettle in the fire-place.

Are You Still in the James Watt Era?

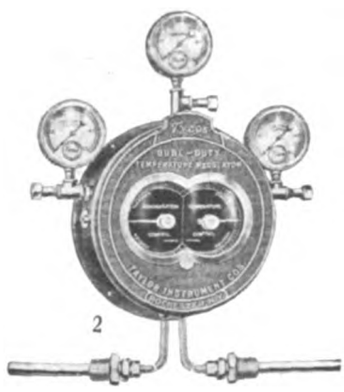
NO matter what you manufacture, there must be some step in the process where temperature or pressure exercises a decisive control on your costs of doing business.

If you are guessing about it, you are still in the same position as the youth James Watt, before he had discovered what steam could do when properly harnessed.

Stop guessing—know! Use exact methods of temperature and pressure control throughout your process work, or in your power plant. The saving in the elimination of spoiled material and in lower cost production will amaze you!

Tycos indicating, recording and controlling instruments are the sixth sense of industry; the modern substitute for that instinct of the mastercraftsman of old which guides production through to the perfect product.

Tycos engineering service is at your disposal to study the particular needs of your industry. May we send you a booklet describing some of the special apparatus made for your business?



Tycos Dubl-Duty Temperature Regulator—automatic in action.

Taylor Instrument Companies

Rochester, N. Y., U. S. A.

Manufacturing Distributors
in Great Britain
Short & Mason, Ltd., London

Canadian Plant
Tycos Building
Toronto

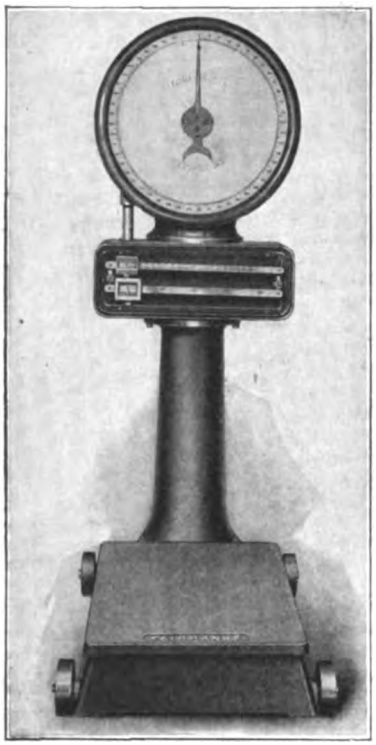
699

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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FAIRBANKS SCALES



Accuracy and Speed in Weighing

The Fairbanks Automatic Dial solves the problem of quantity weighing with accuracy and speed. The dial is so arranged that the weight is read without additions or calculations.

Weights are read at a glance and errors are practically impossible. Fairbanks Scales represent the highest development of almost a century of specialized experience. In hundreds of applications they are giving flawless service—are speeding up production, eliminating errors, saving labor, paying for themselves in countless ways.

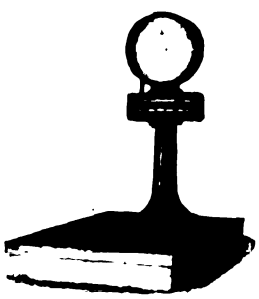
Write for bulletin information on the various types of Fairbanks Scales.

FAIRBANKS SCALES

NEW YORK
Broome and Lafayette Sts.

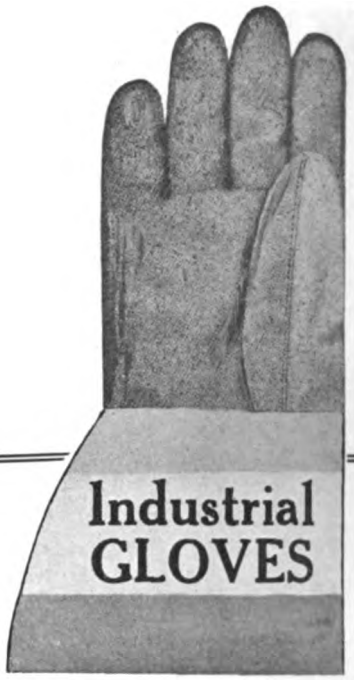
CHICAGO
900 South Wabash Ave.

And 40 other principal cities —each with a service station.



Embody 90 years of Scale Making





Industrial GLOVES

We Can Reduce Your Glove Cost Fully 50%

Manufacturers of Canvas and Leather-Palm Gloves and Mittens for every industrial purpose. Write for samples.

THE SPARTAN GLOVE CO.
Station 3-A Dayton, Ohio

EVEREDY
ELECTRIC HOISTS



"Increase your output"

Catalog No. 50 for the asking

READING CHAIN & BLOCK CORP.
READING PENNA.

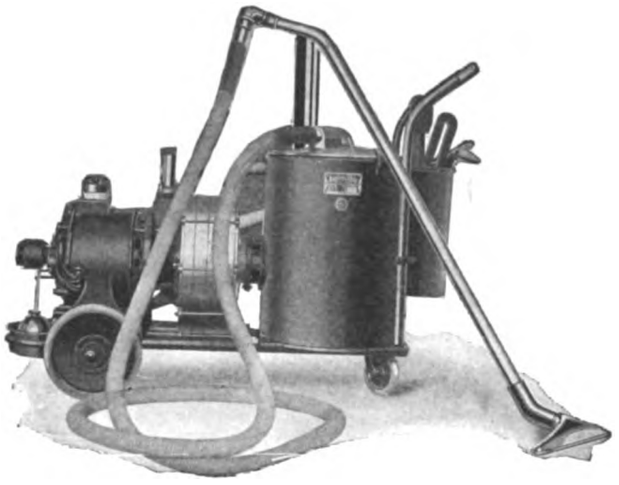
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The D. L. Auld Company recovered $1,500 in gold dust from dirt taken up in 3 hours by the Invincible.

Keeping Air Free from Dirt Saves Expense of Refinishing

Getting more efficient, adaptable and economical cleaning with heavy duty equipment



R. E. Cochran, Asst. Gen. Mgr., D. L. Auld Company, Columbus, Ohio, says:

"In our production of automobile nameplates and interior hardware, one of our greatest problems has been to keep our enameling rooms absolutely free from dirt and dust. Fine particles of dirt, too small to be seen, which get onto the enameled surface, will burn and leave an ash when the enamel is baked. The following acid bath eats out this ash, leaving a hole that must be patched with fresh enamel and rebaked at a considerable expense of time and labor.

"Similarly, small particles of colored enamel dust will discolor the lighter colored enamels when baked, although they cannot be detected before.

"Until 3 years ago our enameling and spraying rooms were cleaned with brooms, which swept much of the fine dirt and dust into the air. Installing a heavy duty portable Invincible Vacuum Cleaner has helped us to overcome this difficulty and materially reduce our refinishing and rebaking cost.

"The Invincible cleaned our jewelry shop in 3 hours, removing dust and dirt from cracks in floors and walls. We burned the refuse and recovered $1,500 worth of gold dust.

"A stationary cleaning plant was too expensive to install, and lacked adaptability. The light household type of portable cleaner would not stand the heavy usage we demand, nor could it develop the suction necessary for thoroughly cleaning our enameling room. The Invincible has other heavy duty portable types beaten for efficiency and time saving.

"In 3 years' use the Invincible has required no repair or replacement—not even a hose replacement.

"Invincible service is prompt and courteous, and shows a clear understanding of cleaning problems."

Tell us your cleaning problems—we can help you solve them.
No obligation—Write today.

Invincible Vacuum Cleaner Mfg. Co.

Dover, Ohio

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

Steel Boxes and Platforms as a part of a materials conveying system is illustrated and described in a catalog issued by the Truscon Steel Company. See page 3.

Catalog A-13 Contains Suggestions for Cutting Overhead by means of steel shelving. See page 92. Fred Medart Manufacturing Co.

Hand Book of the U-Re-Lite, book on protection and safe operation of electrical equipment. See page 8. The Cutter Co.

Speeds for all Transmission Requirements is described in catalog L-44 on Reeves Variable Speed Transmission. See page 96. Reeves Pulley Co.

A Condensed Handy Catalog and Price List showing the complete line of Chucks and Arbors is now ready for mailing by The Jacobs Mfg. Co. See page 97.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move is offered by The American Kron Scale Co. See page 95.

A Belt Lacer, extremely tough, durable, and pliant is shown on page 44-45, by the Clipper Belt Lacer Company.

An Improved Oven for Cores is featured by Young Brothers Company on page 38.

An Interesting Booklet, "Safeguarding Industry's Greatest Asset: Man," explains an important means of accident prevention. See page 111. Industrial Gloves Corp.

Products that Make Your Plant Ship-safe is described in a catalog being mailed out by the Davis Engineering Corp., manufacturers of water heaters, steam traps and other specialties. See page 116.

Coal Handling Economy, possible whether handling five or five hundred tons, is shown on page 89 by Gifford-Wood Company.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 101.

Prices and Details of the Ettco Keyless Drill Chuck can be seen on page 113. Eastern Tube and Tool Company, Inc.

Snap Shots of Sensible Savings. A booklet on the tier lift trucking principle. See page 85, The Lakewood Engineering Company.

Catalog "S" Shows a Means of Solving Current Supply and Cord Maintenance and Economy. See page 60. Appleton Electric Co.

A Jenning Hytor Pump Unit Serving a Five Hundred Thousand KW Power Station is described on page 10, by the Nash Engineering Co.

The Westinghouse Electric & Manufacturing Company Give Some Pertinent Facts on transformers for industrial plants. See page 58.

Coatings that Cut Down Upkeep on Rod, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 83.

Bulletins Describing Locomotive Cranes in sizes from 10 to 50 ton capacities, suitable for handling heavy materials from pig iron and scrap to pulp wood and other products should prove of interest to every industrial executive. Can be had by writing The McMyler-Interstate Co. See page 94.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co., page 72.

A 30-Day Trial Offer on the Federal Electric Siren is offered on page 67, by the Federal Electric Company.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 97.

Information on Sanitary Drinking Fountains, together with prices and specifications, can be obtained from Rundle-Spence Manufacturing Company. See page 74.

A Metal Cased Broom specially made for heavy duty industrial use is manufactured by The Joseph Lay Co. See page 72.

A Paint Made Expressly for Galvanized Iron is described on Inside Back Cover by Goheen Corp.

The Productimetor Catalog Describes Counting Machines which aid in speeding up production. For a copy see page 110. Durant Manufacturing Co.

Publication 830 Contains Complete Information and an Interesting Discussion on Methods of Battery Charging. Issued by the Cutler-Hammer Manufacturing Company. See page 28.

Five Very Interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 116.

Blue Printing in Four Minutes is described by the Paragon Machine Company. See page 97.

An Automatic Conveyor that Costs Less than One Dollar per Week is shown on page 112 by the Chicago Automatic Conveyor Co.

Bulletin 129 Describes the Multiple Report Underfeed Stoker. See page 32. Detroit Stoker Company.

Conveying the Heavy Loads of Industry is part of the service Jeffery Engineers have rendered for the past 50 years. See page 54 for a list of the Jeffery Manufacturing Company products.

The Value of Good Lighting in Industry is shown on page 66 by the Industrial Lighting Committee of the National Electric Light Association.

What Your Truck Investment Should be Worth. A question answered by the Yale & Towne Manufacturing Company. See page 42.

A Factory Signal System on a Special Approval Offer. See page 48. The Sterling Siren Fire Alarm Company, Inc.

Catalog Describing Tramrail Installations Showing Hundreds of Illustrations of Installations is being mailed by the Cleveland Crane & Engineering Co. See page 68.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchclock Corp. See page 74.

The Aid Given to Manufacturers in the Use of Fractional H.P. Motors is described on pages 65-81. Wisconsin Electric Co.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see pages 65-81. Wisconsin Electric Co.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 61.

A New Idea in Trucking Wheels for industry. See page 75. The Bassick Company. A booklet and a free sample of the new wheel is offered.

The Special Features of the Hack Saw Blade is described on page 84, by Victor Saw Works, Inc. Sample blades offered free.

"Elapsed Time Records," is a booklet containing interesting data on time keeping problems. Free on request. The Calculagraph Co. Page 2.

A Free Trial Offer on Ten Gallon of Skybryte and a Skybryte Brush. For coupon see page 57. The Skybryte Company.

A New Alternating Current Motor with many features of approved electrical and mechanical construction has just been developed by the Diehl Manufacturing Company. See page 111.

Catalog on Metal Buildings. See page 9, Maryland Metal Building Co.

A 60 Page Book on Floor Operated Electric Hoists and Also the "Book of Illustrated Economies," can be obtained from the Shepard Electric Crane & Hoist Company. See Back Cover.

Pamphlet 101 Contains Complete Information and Prices on Renewable Fuses. For a copy see page 102. Chicago Fuse Manufacturing Co.

The Latest Data on Battery Performance and Battery Cost in electric industrial trucks is given in the service rendered by the Electric Storage Battery Company. See page 70.

Roller Bearings that have Increased the Transportation Efficiency of Industrial Trailers are described on page 7, by the Hyatt Roller Bearing Company.

The Solution to the Conveying, Elevating and Power Transmission Problems described in illustrated catalogs is offered by the Link-Belt Company. See page 73.

Reducing Your Glove Cost 50%. See page 106. The Spartan Glove Co.

Jenkins Bros. Feature Their Line of Valves in use by many hotels, hospitals, industrial plants and public buildings everywhere. See page 48.

A Folder, "Choosing the Locomotive for the Industrial Plant," can be obtained from Davenport Locomotive Works. See page 30.

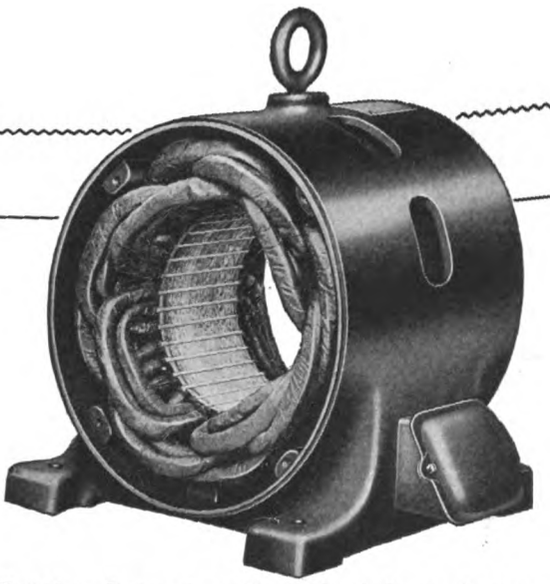
Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 52.

Sample Band or Hack Saw Blades sent on request. See page 52. The Henry G. Thompson & Son Company.

Handling-Cost Reducing Cranes in Capacities from 10 to 40 tons have been recently added to the extensive line of

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"They Keep a-Running"



Complete Stator Assembly 5 Horse Power Century Squirrel-cage Induction Polyphase Motor

Field Coils
Thoroughly Insulated—Well Ventilated

Field coils in Century Squirrel-cage Induction Polyphase Motors, in addition to being well ventilated, are thoroughly insulated against moisture and dampness.

1 The pyramidal style of field winding is used in all Century Squirrel-cage Induction Polyphase Motors, except (for constructional reasons) the 2-pole motor.

2 Pyramidal windings possess generally better electrical characteristics and permit more thorough ventilation.

3 Coils are form wound to uniform proportions, and held firmly in place in the slots with retaining wedges.

4 Slot insulation is made up of several layers of fish paper and varnished cambric. Coils insulated from each other by layers of varnished cambric and tape.

5 Completed stator winding is thoroughly saturated with insulating compound and then baked.

6 Finished stator assembly is subjected to the standard ground test recommended by the Electric Power Club and the A. I. E. E. rules.

Built in all standard sizes from ¼ to 50 horse power. Temperature rise not more than 40° Centigrade.

Send for Bulletin No. 38

CENTURY ELECTRIC CO.

1806 Pine St. *For More Than 22 Years at St. Louis* St. Louis, Mo.

¼ to 50 H.P. Century MOTORS ¼ to 50 H.P.

When writing advertisers please mention Industry Illustrated

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HOW AND WHY
THE BEMIS BAG COMPANY
Use The Productimeter

The following is from a performance survey on Productimeters made by the H. P. Gould Company. The facts disclosed are unbiased and the result of an independent investigation.

"We are one of the largest cotton and burlap bag manufacturers in the world. We manufacture entirely to orders, many of which call for carload lots. Therefore, it is essential both that we get an accurate count on the production for each order, and with a view to maximum efficiency, that the count be obtained as easily and quickly as possible.

"For this we chose Durant Productimeters in preference to other counting machines because they are equipped with two registers. This is a great convenience and time saver besides preventing errors, because an exact tally for both the day's production and the production on each job or order is shown at the same time by means of the two registers."

Productimeters can be applied to your business with profitable results. They furnish quickly and accurately the figures that are essential to exact production control.

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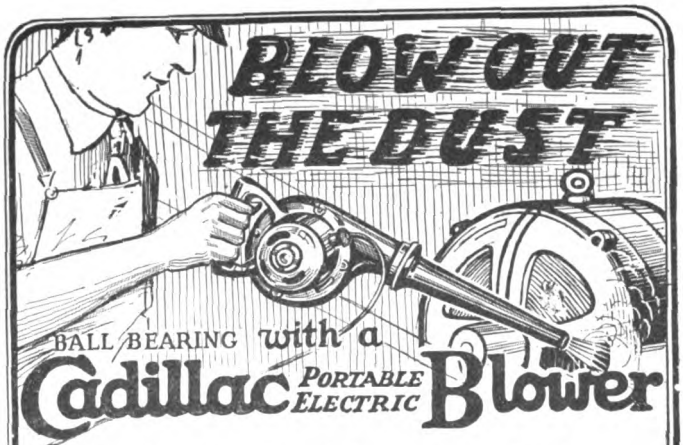
DURANT *Manufacturing Company*

610 Buffum St.
Milwaukee, Wis.

Write for the Productimeter catalog and further information.



BLOW OUT THE DUST



BALL BEARING with a

Cadillac PORTABLE ELECTRIC Blower

IT PAYS to keep the windings of your electric motors free from dust, dirt and carbon, and thus prevent "shorts" and "burn outs." The CADILLAC delivers a powerful blast of dry air at the correct pressure to clean motors and similar equipment without injury.

It reduces the fire risk and creates more healthful working conditions, and has hundreds of uses in the power plant and factory.

It weighs but a few pounds, is complete in itself and operates from any electric light socket.

Equipped with NORMA Precision Ball Bearings, Requires No Oiling.

Write for descriptive folder giving prices and testimony of prominent users

CLEMENTS MFG. CO.
612 Fulton Street, Chicago, Ill.
Canadian Factory: 74 Duchess St., Toronto, Ont.
Export Department: 149 Broadway, New York City

standardized cranes manufactured by the Northern Engineering Works. For descriptions of these new cranes, see page 48.

A Steam Trap on 30 Days' Free Trial. Also booklet R-268 which describes the new Number 9 Sarco Steam Trap. See page 80. Sarco Company, Inc.

A 50% Saving in Labor Through the Use of an Overhead Handling System, is shown on page 19, by the Richards-Wilcox Mfg. Co.

Catalog Describing Forges, Drills, Punchers, Shears and Bar Cutters for use in every shop can be obtained from the Buffalo Forge Company. Page 76.

A Booklet Entitled, "Saving Slippage and Space," contains facts on the use of short center drive. For a copy see page 101. F. L. Smidth & Co.

The World's Market Place for Industrial Equipment is a description given to the Dodge Service to Industry. See pages 62-63. Dodge Manufacturing Corp.

Details on the Super-Hoist, an unusual chain hoist with many exclusive features, is shown on page 78. Wright Mfg. Co.

Catalog No. 26 Is a Clear Exposition of Present Day Speed Reduction Practices. See page 26. W. A. Jones Foundry & Machine Co.

A Hand Book on Office Efficiency and Giving Information on Visible Index System is offered by the Globe-Wernicke Company. See page 77.

Complete Protection in Measurement Operations which avoid human errors is shown on page 50. Toledo Scale Company.

Oil Burners as a Means to Economy on Various Industrial Applications is described in bulletin No. 112. See page 52. Hauck Mfg. Co.

Catalog on Equipment for Checking Time and Production. See page 111, Henry Kastens.

Eliminating Dust, Filings, Lint, etc., from Workrooms as a means towards industrial efficiency is described on page 107 by Invincible Vacuum Cleaner Manufacturing Company.

General Catalog No. 28 contains the complete line of power saving, transmission equipment, sold by the Pyott Foundry Co. See page 113.

Quantity Weighing with Speed and Accuracy. See page 106. Fairbanks Scales.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 106.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 101.

Catalog No. 10 Describes an Indicating Thermometer useful for various industrial purposes and sold at an exceedingly low price. See page 114. The Motometer Co., Inc.

Illustrated Catalog Describing Compact, Sturdy, Steam Engine for many industrial purposes is offered by the Troy Engine & Machine Co. See page 79.

The Savings in Money and Men Through the Use of Lift Trucks in some of the largest industrial plants, is shown on pages 86-87, by the Stuebing Truck Company.

A Diagram Book Illustrating the Methods for Saving Space with the use of racks and lifters is offered by Economy Engineering Company. See page 40.

Illustrated Folder and Prices on steel platforms, boxes, etc., is described on page 114. The Powell Pressed Steel Co.

Advice on the Care and Maintenance of Boilers and the Cooperation of one of the engineers is the service offered by the Chaplin-Fulton Manufacturing Company. See page 78.

High Speed Drills for high speed production. See page 92. The Cleveland Twist Drill Co.

A New Industrial Catalog Full of Facts and Figures on Shafting, Bearing Boxes, Pillow Blocks and Other Transmission Equipment is now being issued by the Fafnir Bearing Company. See page 106.

Another Description of a Solution to One of Industry's Transportation Problems is described on page 90 by the Baker R & L Company.

The Economical Utilization of Storage Space is the service offered by Durand Steel Locker Company. See page 25.

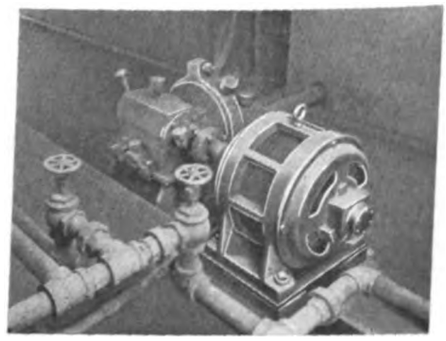
Complete Details and Prices of All Steel Fabricated Buildings can be obtained from Blaw-Knox Company. See page 56.

An Interestingly Illustrated Folder describing a well made pressed steel shaft hanger and other transmission pulleys, hangers, etc., can be obtained from the American Pulley Company. See page 91.

A Free Copy of "Hacksawology," full of useful hints on the use of hack saw blades. See page 88. Simonds Saw & Steel Co.

Bulletin 38 describes the bearing assembly of the Center-Type SC Motor, the motor especially adapted to material-

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handling machinery. See page 109. Century Electric Company.

New Catalog No. 57B Describing the Six Points of Extra Value of the Parker Vise can be obtained from the Charles Parker Company, see page 104.

Booklets on Automatic Temperature Control of Heat in virtually every industry are offered by the Taylor Instrument Companies. Page 105.

The Two Distinctive Features of the General Electric Automatic Resistor Starter is pictured on the General Electric Company insert.

Also Complete Information on the G. E. General Purpose Small Motor, the type KT, the type SCR, the type BD, and type CD, is described in this insert.

Silent Service Gears that show service of from 4 to 10 years are shown in the General Electric Company insert.

The Booklet, "Getting the Drop on Competition," contains some valuable information on saving time and increasing production. See page 6. McCaskey Register Co.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 114.

A Monthly Bulletin, "The Conveyor," is a treatise on new applications of mechanical handling. This service is free to plant men, engineers and executives. The Chain Belt Company. Page 120.

A 120-Page Catalog on the choice of adjustable Pipe Hangers. Grinnell Company. Page 24.

One of the Various Industrial Uses of Dow Conveyors is shown on page 1, by the Logan Co.

Sanitation plus Good Appearance is the theme of Sanymetal Products Company advertisement, page 115. Bulletins offered.

"Mr. Barber's Scrap Book," contains information on the reduction of handling costs. See inside Back Cover. Barber-Greene Company.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 90.

The Advantages of Co-ordination of Parts, Motors and other Accessories for cranes is proven on page 99. Harnischfeger Corporation.

Complete Data on the Venturafin Heating Methods can be obtained from American Blower Company. See page 93.

Seven Different Bulletins Are Offered by the Mercury Manufacturing Company. These describe various trailers and tractors they manufacture. See page 103.

A New Line Shaft Bearing to Fit Narrow Hangers is described for the first time on the inside front cover. Bulletin No. 130 is also offered. Hyatt Roller Bearing Co.

Bulletins on Various Pneumatic Systems in Successful Use are offered by The Dust Recovery and Conveying Co. See page 20.

Louden Overhead Book pictures many overhead conveying installations in various industries. Can be obtained from The Louden Machinery Co. See page 119.

C-100 is a Descriptive Booklet Offered by the Edwin L. Wiegand Company and describes heating strips for every industrial purpose. See page 117.

Descriptive Circulars Illustrating Steel Fabricated Building for every industrial requirement can be obtained from the Martin Steel Products Co. See page 82.

The New 1925 Catalog containing 40 pages of interesting data on electric lift trucks and profusely illustrated is now ready for mailing by The Elwell-Parker Electric Co. See page 21.

Keeping Dirt and Dust Out of Electrical Equipment is essential to efficient operation. A descriptive folder giving price list of portable electric blowers and testimonials by leading manufacturers is offered by Clements Mfg. Company. See page 110.

The Elimination of Production Losses through the use of precision ball bearings and roller bearings is part of the service rendered by the engineers of the Norma-Hoffmann Bearings Corp. See page 82.

Industrial Railway Equipment of every description is manufactured by Easton Car & Construction Co. Complete bulletin issued. See page 84.

Foot Protection for Workmen, an aid to efficient production. See page 82. F. J. Stahmer Shoe Company.

End Gram Wood Wheels for Trucks used in industrial building is described on page 72, by the Metzger Company, Inc.

Bulletin 35 Describes a Clutch which is adaptable and standardized for many various machines. See page [illegible] Conway Clutch Company.

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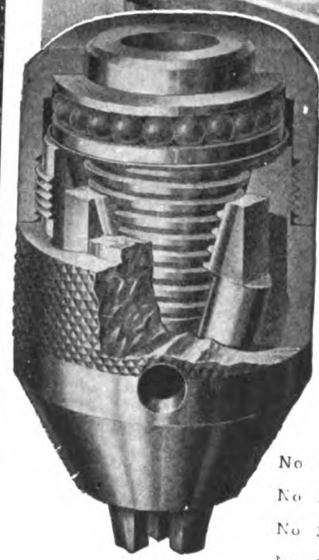
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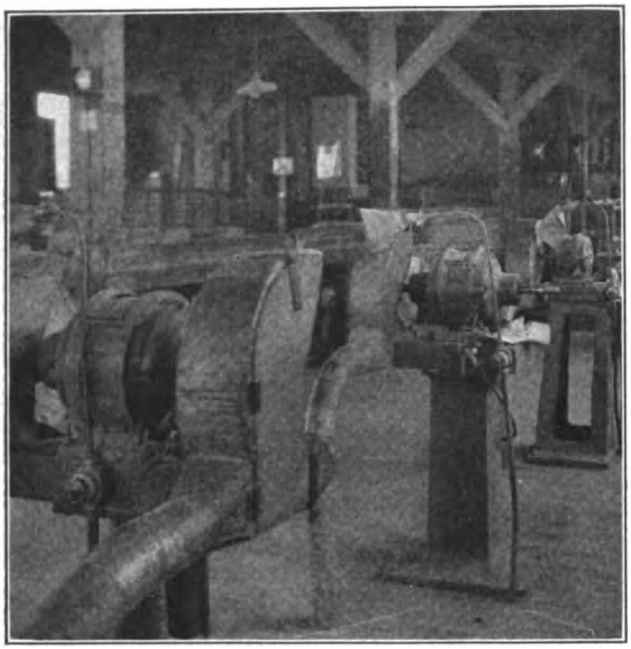
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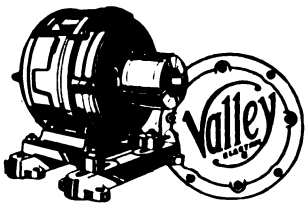
The only service necessary on the installation was the cleaning of a number of motors in which sawdust had accumulated. The total cost for this service in four years on the entire 125 motors was $73.00.

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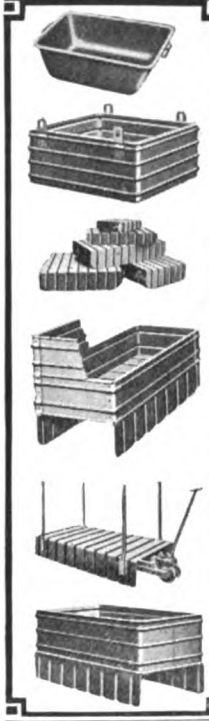
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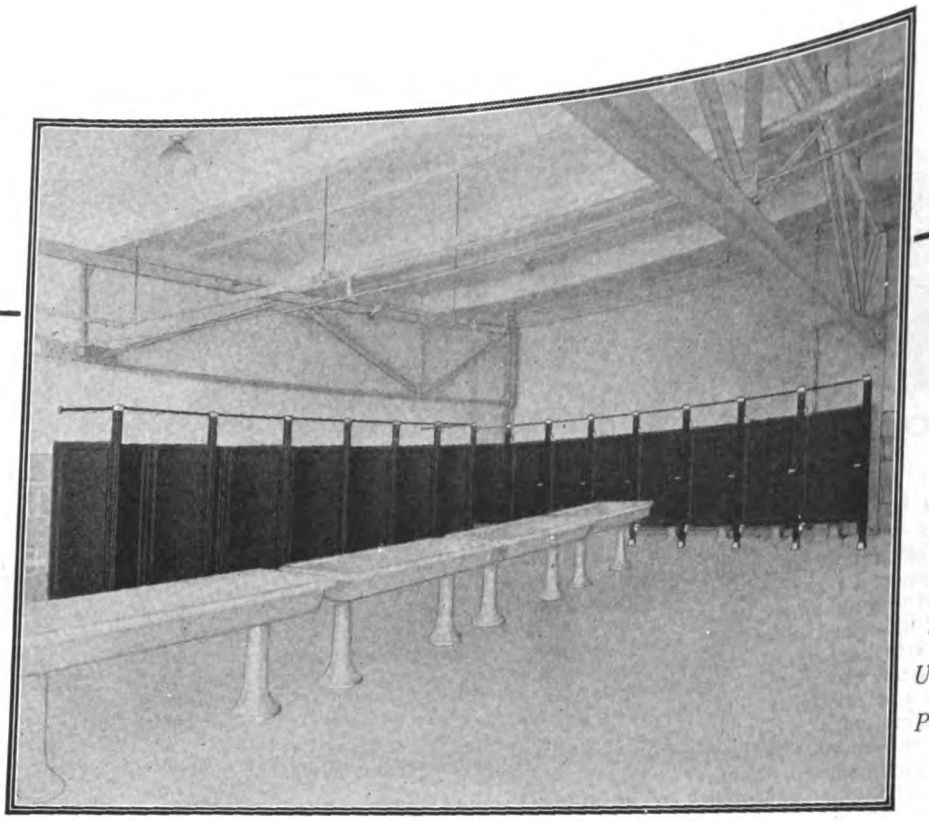
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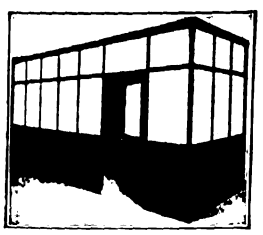


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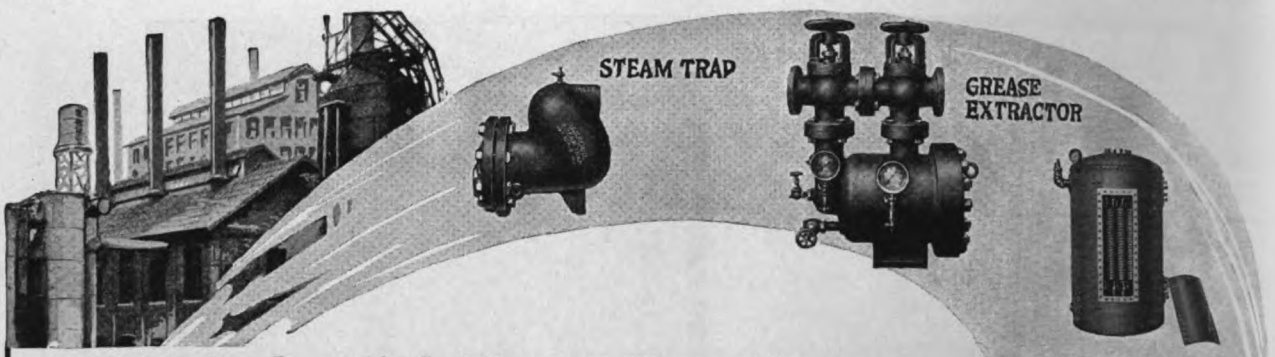
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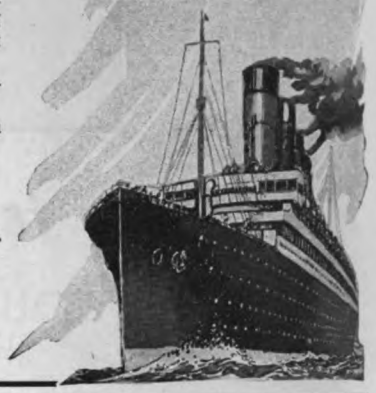
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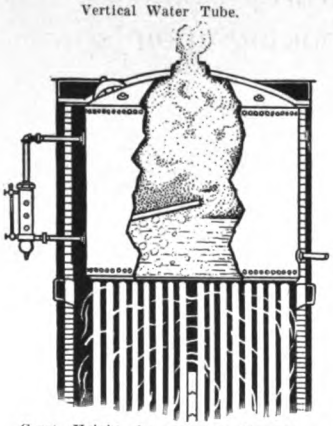


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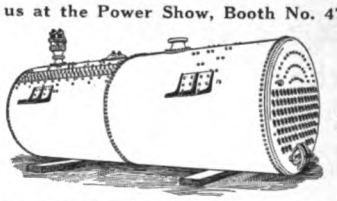


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Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912

of INDUSTRY ILLUSTRATED, published monthly at New York, N. Y., for October 1, 1925.

County of New York } ss.
State of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared John H. Van Deventer, who, having been duly sworn according to law, deposes and says that he is the Editor of the INDUSTRY ILLUSTRATED, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:
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Editor: John H. Van Deventer, 120 West 32nd Street, New York, N. Y.
Managing Editor: None.
Business Manager: Harvey Conover, 120 West 32nd Street, New York, N. Y.

2. That the owners are:
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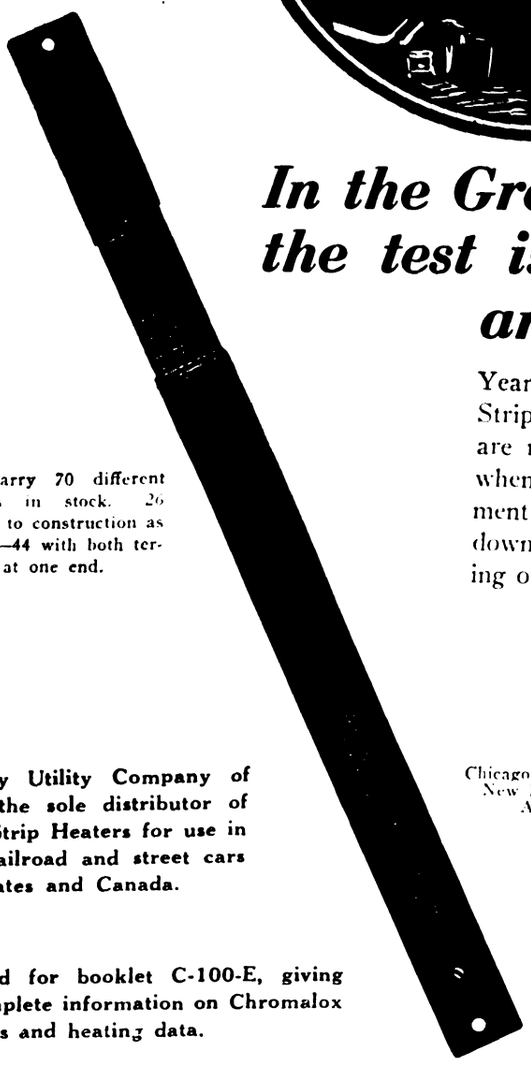
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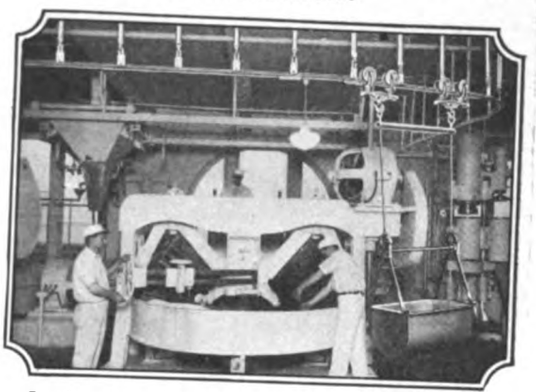
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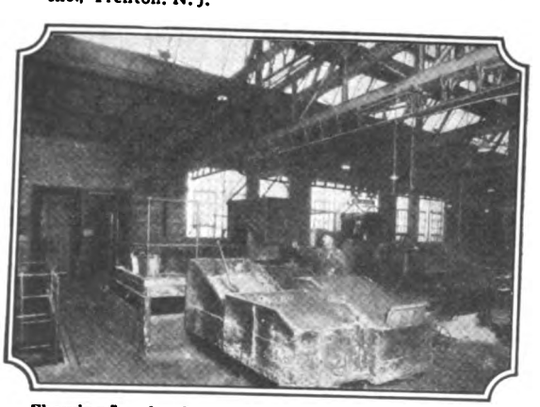
M. K. & T. General Reclamation Shops, Parsons, Kansas. $1200 Louden installation paid for itself in less than a year and saves 1-3 labor cost.



Louden overhead equipment in the H. J. Heinz Co. spaghetti and macaroni department serving two kneading machines and four presses, successfully solving a problem of difference in elevation between kneading machines and presses.

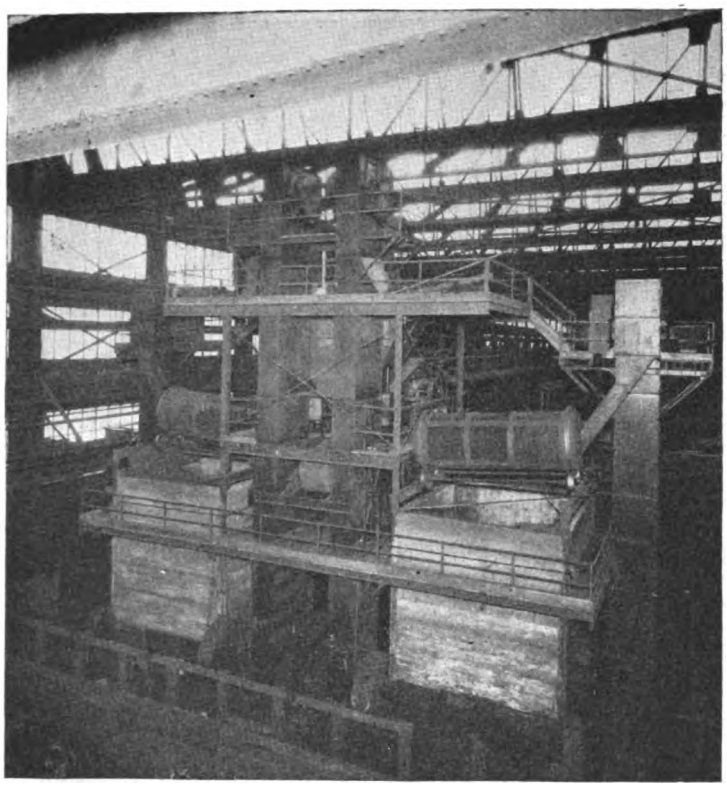


Beautiful, lustrous fragile chinaware—handled on Louden Monorail. Finished ware being taken from inspection room to stock department. Pottery of Lenox Inc., Trenton, N. J.



Showing Louden System in core room of International Motor Co., handling sand from sand mixers in pit through four lines of Louden track direct to core room.

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Reconditioning Unit

Showing (right and left) Rex Elevators, (buckets on belt) for knockout sand, screens and bins, (center) Rex Elevators for tempered sand discharging to disintegrators and belt conveyor to foundry floor. Paddle Mixers are below.

Modernizing an Old Plant with Rex Conveying

Graphically shown on this page is the story of the modernization of an old plant by the installation of conveying machinery.

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Shown herewith are views from a Grey Iron Foundry that was modernized by the installation of complete mechanical handling equipment.

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At left: strand of REX genuine Chabelco 1030



Rex Scraper Flight Conveyor

(Two are used.) For recovery of knockout sand; this operates below the foundry floor level, under knockout grates and discharges to Magnetic Separators in Reconditioning Unit.



Rex Belt Conveyor

To foundry floor, showing plows which automatically distribute sand to all molding floors.



First Molding Floor

Two tilting hoppers and molding machines are used; pouring is at both ends of the floor. The molders are always working away from the heat. The reconditioning unit is shown in the background. The handling is all by overhead cranes.

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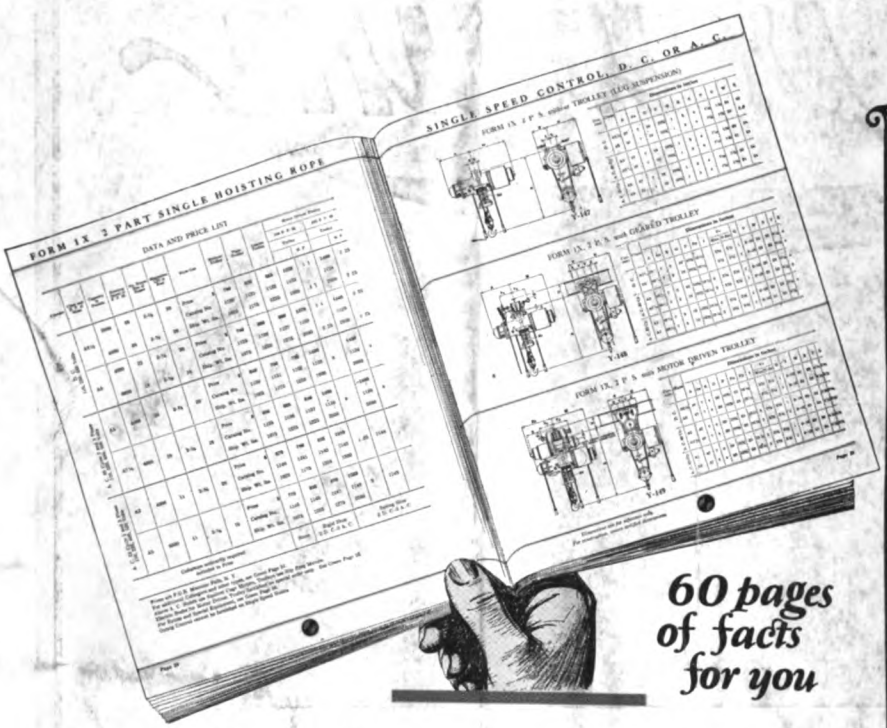
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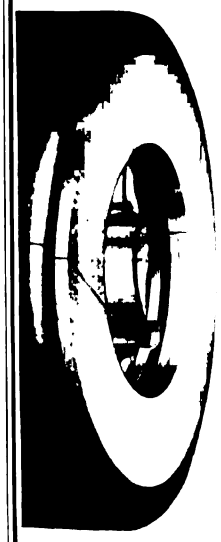
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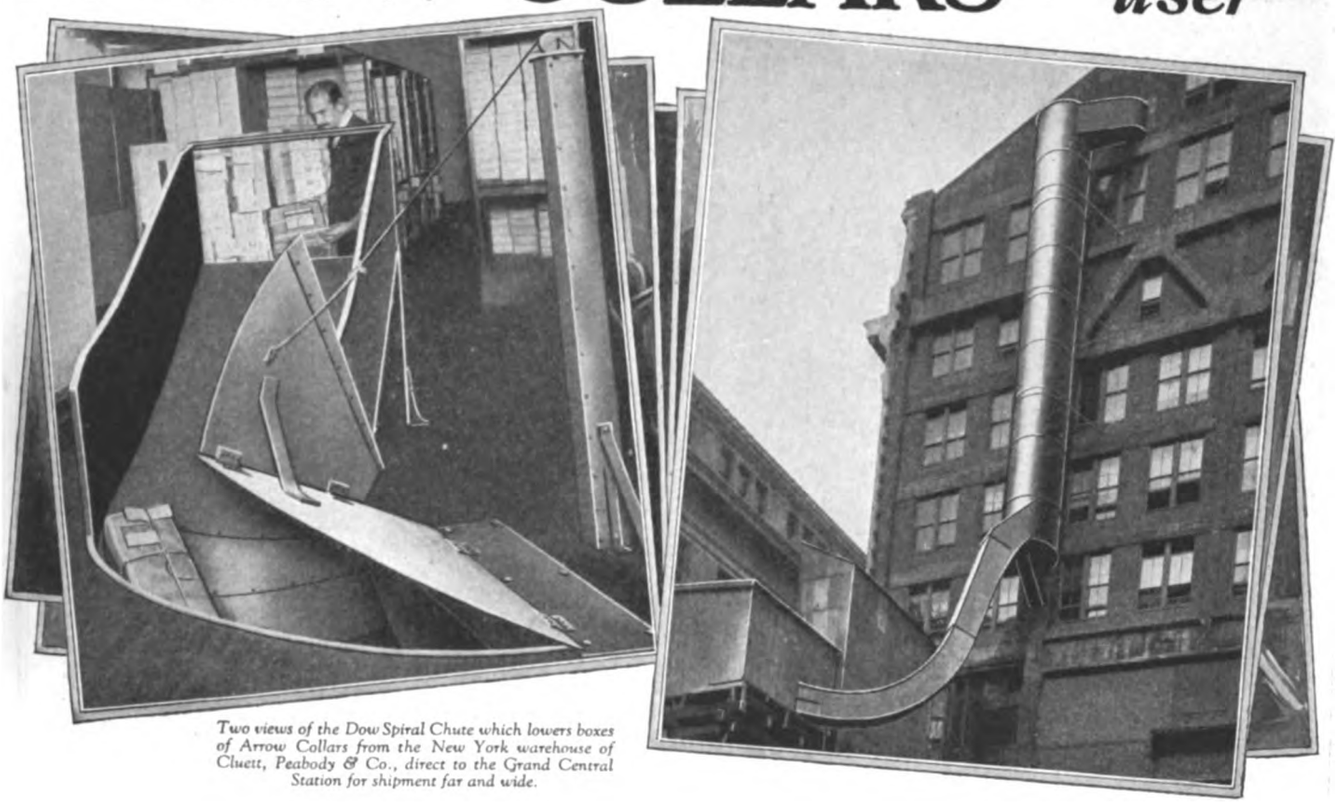


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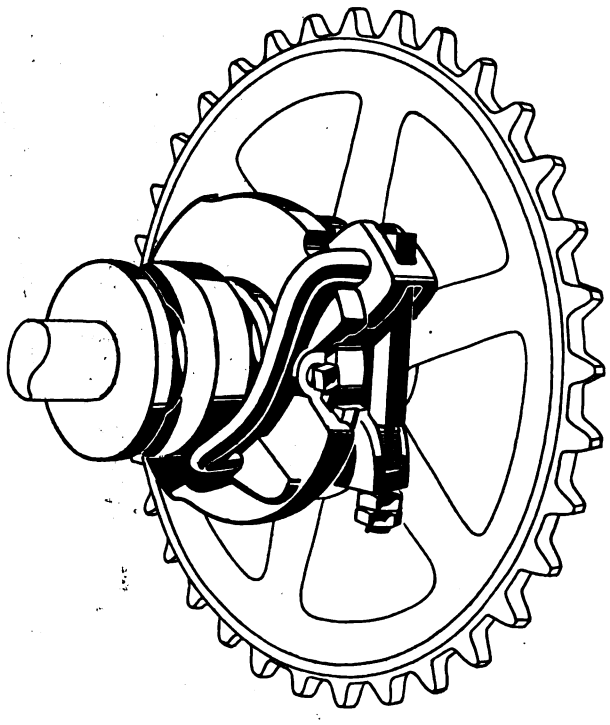
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To these industrialists, power is the big essential for production, whether the product be shoes, steel rails, motor cars or rocking chairs. It is the essential common "raw material" that they all use in making what each has to sell.

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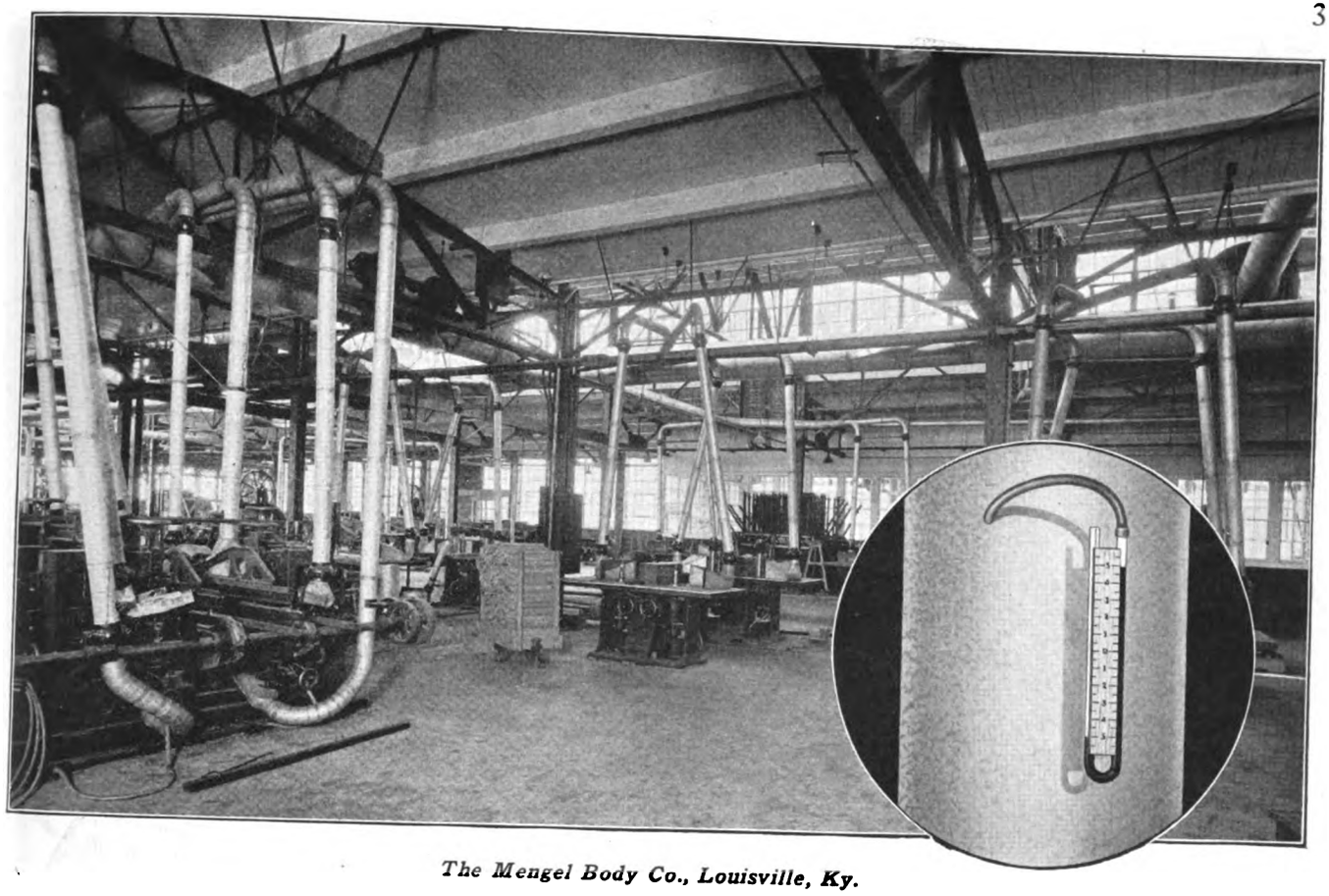
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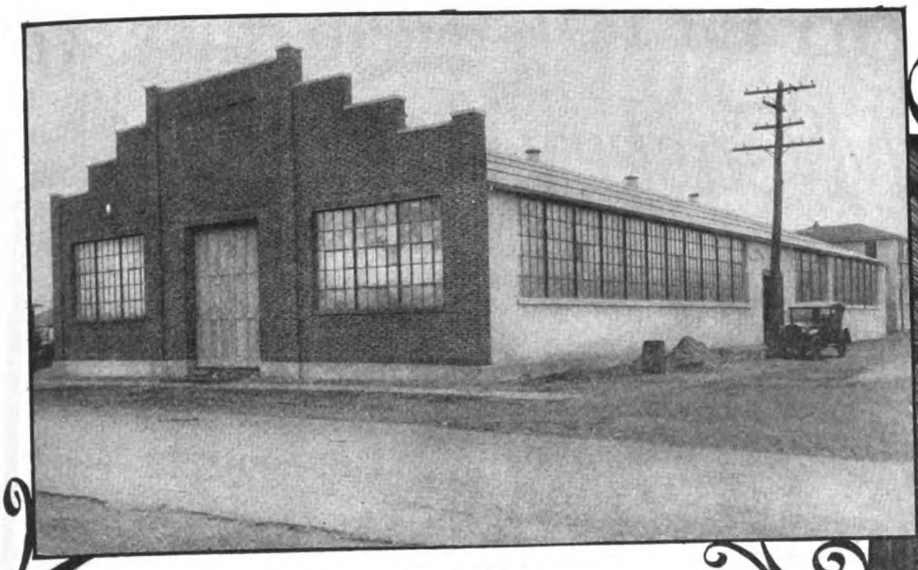
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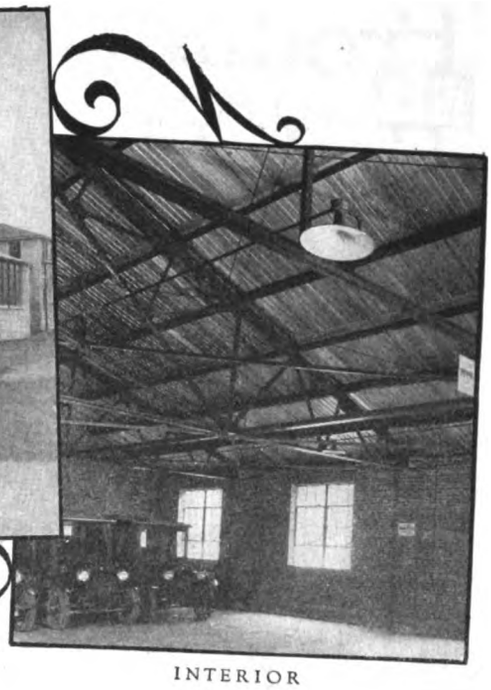
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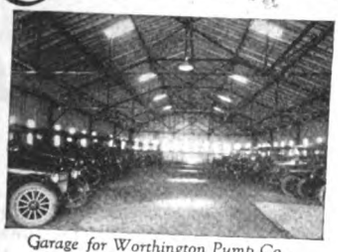
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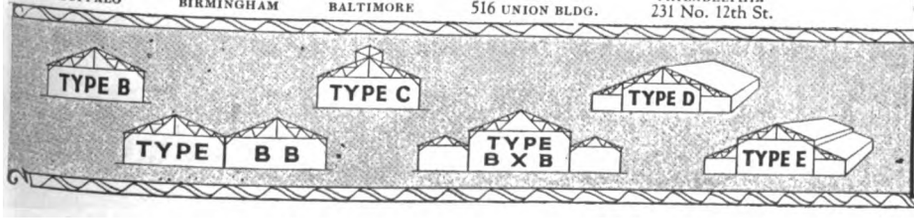
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21 McCaskey Boards control production in plant of Standard Scale & Supply Co.

"OUR factory order and production system," says H. C. Molter, Chief Clerk, Standard Scale & Supply Co., Beaver Falls, Pa., "is entirely controlled by our McCaskey Register System—comprising McCaskey Boards of 500-item capacity in our foundry, forge, cleaning and machine shop, control board in our foreman's office, and 16 80-clip McCaskey Boards in our assembly or finished stock department.

"The factory makes out the original order, and with the McCaskey carbon-backed slip a copy is made on stiff cardboard for our cost department. The department foreman makes out 3 McCaskey slips at one writing—an original for the office, a yellow copy for the department next receiving the material, and a pink copy for the department where the work was done.

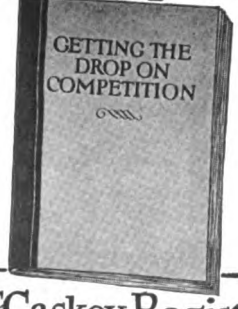
"By our former system the men kept a tally of the pieces as made. Many inaccuracies resulted from neglecting to record the work, reporting time on the wrong order, lost sheets, and the inability of the office to tell the progress of any part.

"The McCaskey has helped to increase production. Errors have been reduced, our shop records are now reliable, and our production costs are accurate.

"With our old system, at least 2 extra clerks would be necessary to give us the information now obtained by spending a very few minutes a day on the McCaskey units."

Thousands of concerns tell the same story of McCaskey efficiency. Write today for your copy of our *free booklet*, "Getting the Drop on Competition," and learn why we are able to run this never-ending stream of proof of McCaskey efficiency.

Mail this coupon today



The McCaskey Register Co.
Alliance ~ Ohio

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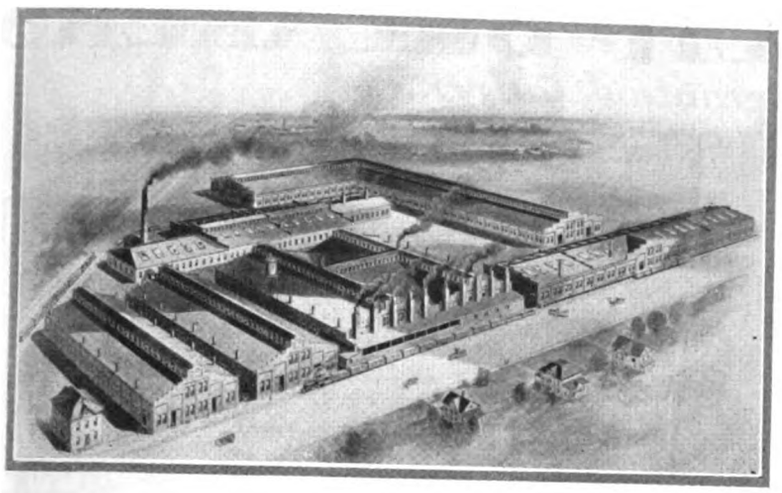
THE MCCASKEY REGISTER CO.
Industrial Division

Alliance, Ohio McCASKEY ONE WRITING SYSTEMS **Galt, Canada**

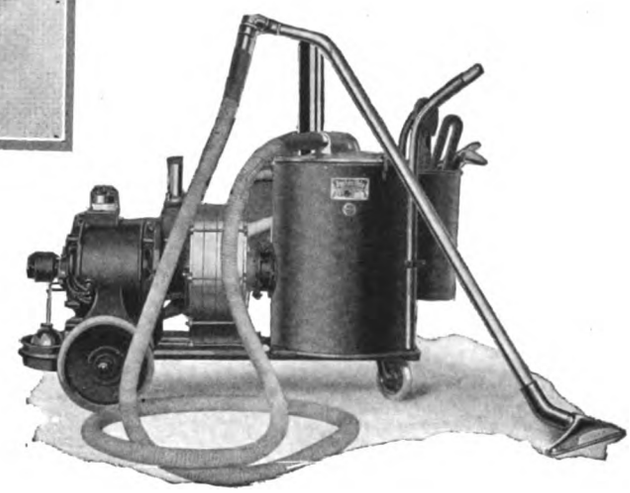
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An INVINCIBLE PORTABLE VACUUM Cleaner paid for itself 20 TIMES in the last 5 YEARS



At the Belmont Stamping and Enameling Co.



H. W. Judkins, Treasurer and General Manager, Belmont Stamping & Enameling Company, New Philadelphia, Ohio, says:

"A clean enamel shop is half the secret of success in making our product—good enameled kitchenware.

"Five years ago we saw an 'INVINCIBLE' portable vacuum cleaner at work cleaning another kind of a shop. We bought one to try to lessen the troublesome enamel dust that was causing so much spoilage and high cost of our product.

"Ever since that time, this one sturdy vacuum cleaner has enabled 1 man to do all the work formerly done by 3 men with brooms and brushes. Our cleaning is now done better than ever before.

"Our service is particularly hard on a vacuum cleaner. The enamel dust is so gritty and abrasive that it would destroy an ordinary vacuum cleaner in no time, yet the 'INVINCIBLE' portable vacuum cleaner has done, and is doing our work with ease.

"We have 175,000 square ft. of floor space to be cleaned with our vacuum cleaner. 250 operators work in this space. . . . Even if there were no labor to be saved, we would use the 'INVINCIBLE' because it betters our product.

"But the labor saving is well worth while also. We save $2,000.00 a year in labor alone, because one man now cleans our entire plant, where before it took 3 men to sweep it.

"Our cleaning costs on 300,000 pieces a month, formerly was 9c per hundred pieces. Since using our 'INVINCIBLE' portable vacuum cleaner, this cleaning cost has been cut to 3½c per hundred pieces, or a saving of 5½c per hundred pieces. During our rush production season, we have saved $4,000.00 a year by working our 'INVINCIBLE' on a night shift also.

"Our 'INVINCIBLE' vacuum cleaner has paid for itself in net savings 20 times over the last 5 years, or in other words it pays for itself every three months. It is in perfect condition today, and is good for many years more. Maintenance and current, added to a depreciation and an interest charge, would total only about 86c a day, while the labor saving alone is $6.66 per day. 'INVINCIBLE' Hose lasts over a year, even with our hard service.

"Our 'INVINCIBLE' vacuum cleaner removes the dirt even from the cracks in our matched maple flooring, instead of merely transferring a large part of it, as sweeping used to do.

"On account of its portability, our machine is used all over the shop, in the isles and warerooms where work in process is kept. It also cleans the roofs of our dry houses and ovens."

Tell us your cleaning problems—we can help you solve them.
No obligation. Write today.

Invincible Vacuum Cleaner Mfg. Co.

Dover, Ohio

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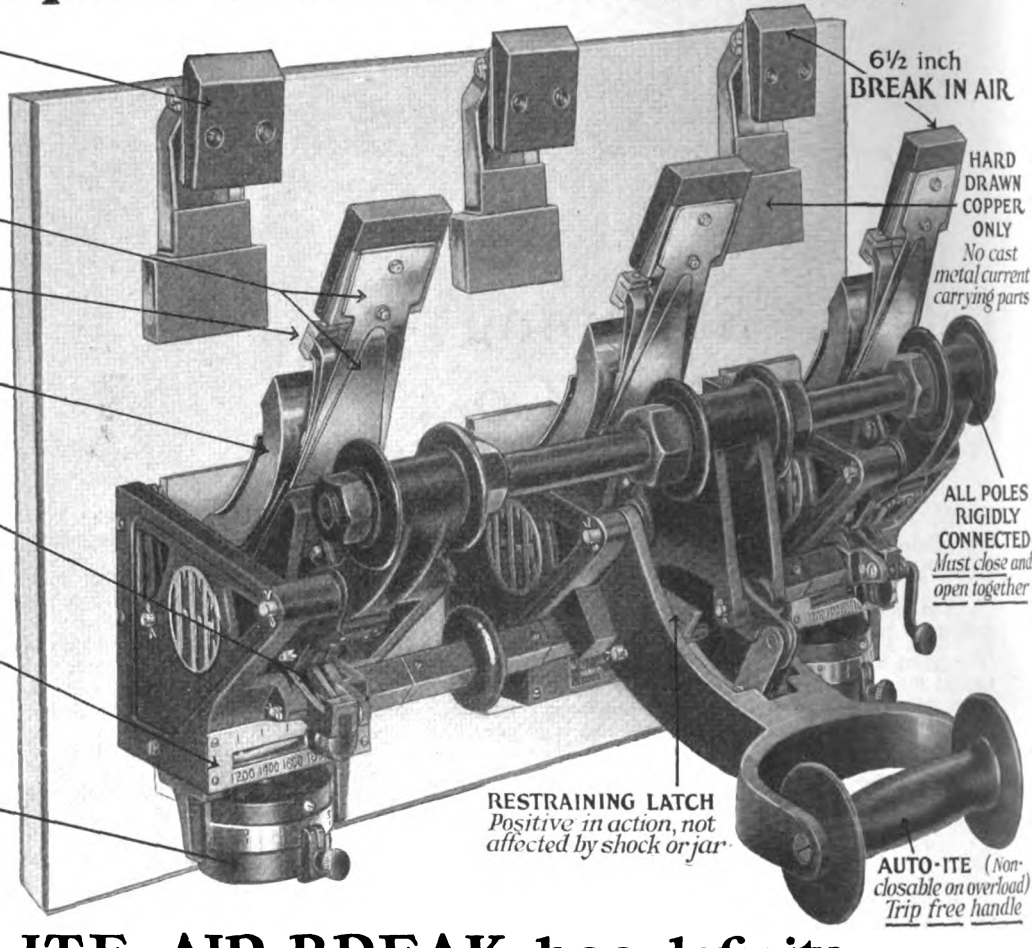
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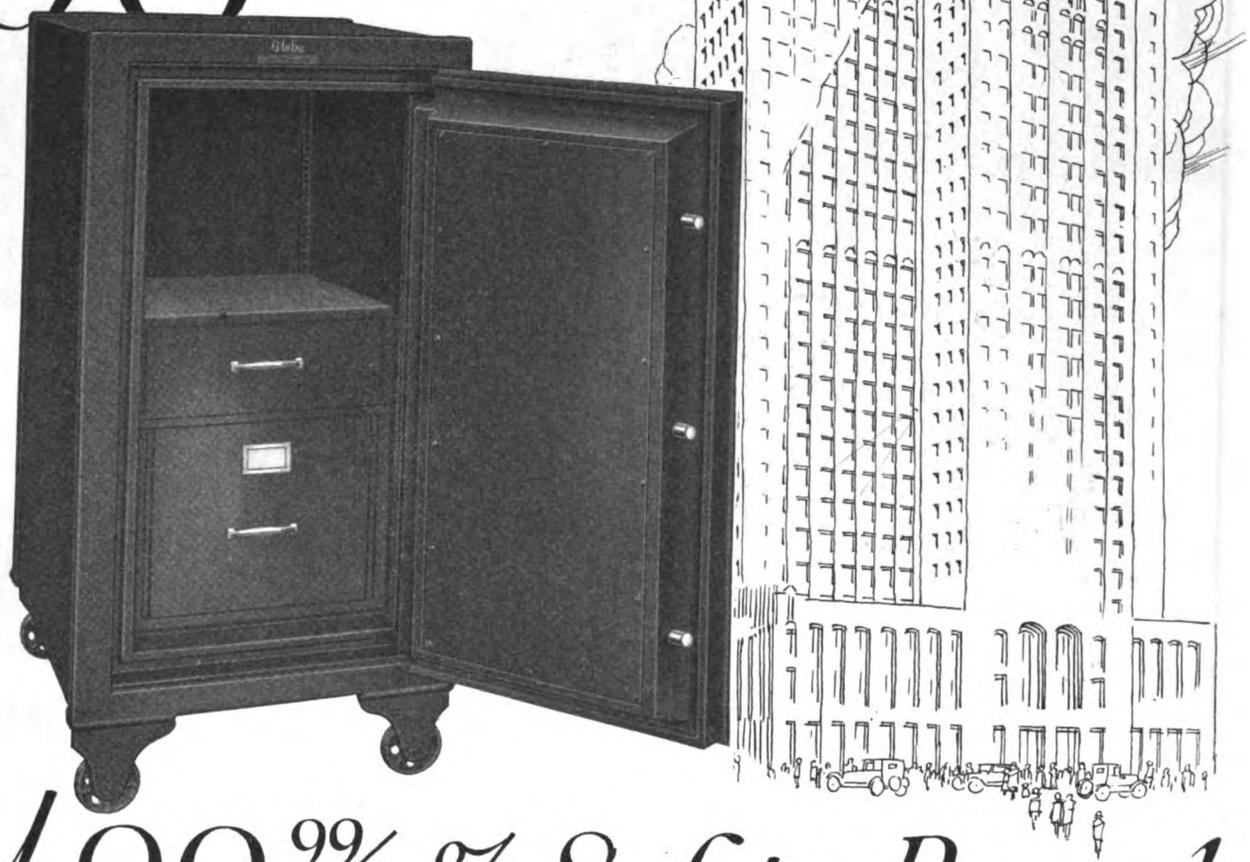
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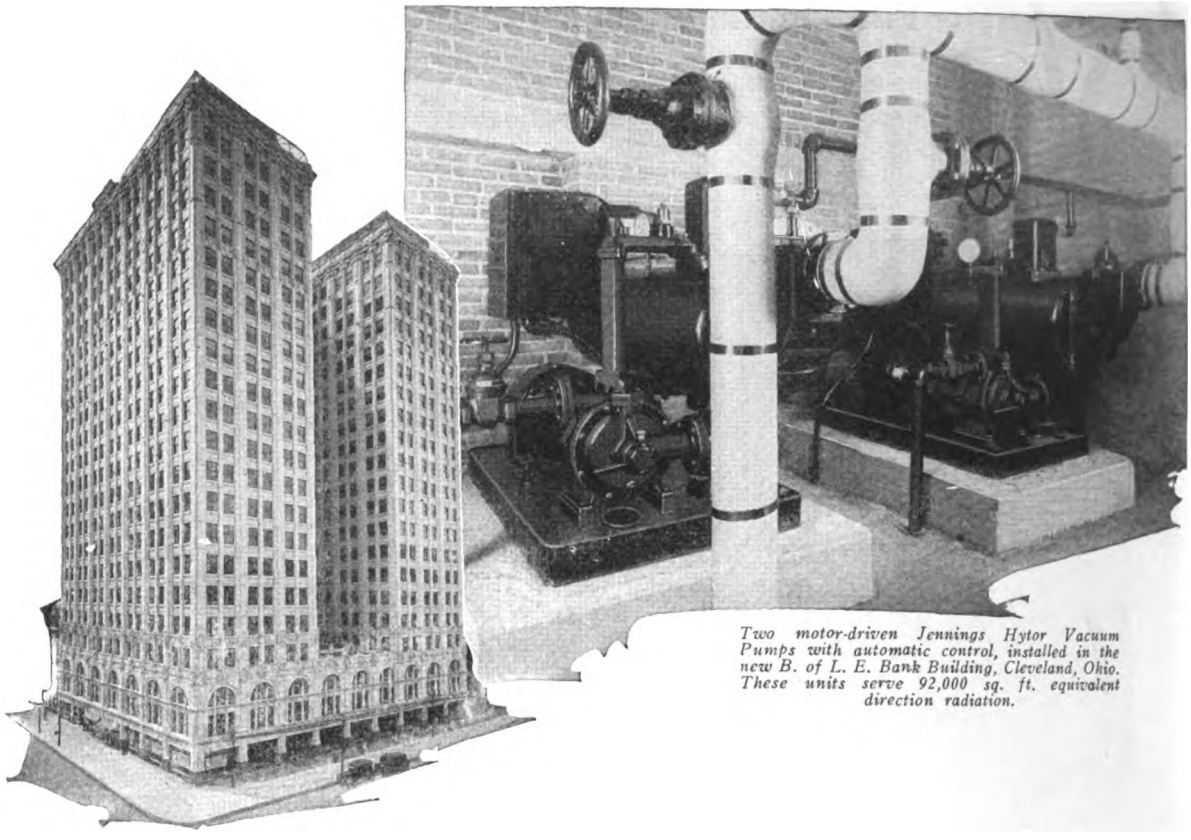
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Two motor-driven Jennings Hytor Vacuum Pumps with automatic control, installed in the new B. of L. E. Bank Building, Cleveland, Ohio. These units serve 92,000 sq. ft. equivalent direction radiation.

This is the new Bank Building of the Brotherhood of Locomotive Engineers, Cleveland, Ohio. Mr. R. G. Nairn, Engineer of Construction, Cleveland, Ohio

Hytors, a logical choice for this up-to-date plant

Starting in 1920 with modest quarters, the labor bank of the Brotherhood of Locomotive Engineers, Cleveland, grew so rapidly that by 1925 larger facilities became necessary. As a result, the new 19-floor bank and office building, shown at left, was planned and built.

This building is up to date in every respect. Only the most improved equipment is installed for providing light, heat and power.

For removing the condensate and air from the exhaust steam heating system, Jennings Hytors were a logical choice. For in the many years they have been in use, Hytors have proved again and again that they can always be depended on for efficient trouble-free performance —the kind of performance that is indispensable in getting the best results in cooperation with other high-grade equipment in the plant.

For complete information on Hytors and the uses for which they are recommended, write for our illustrated bulletins.

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December, 1925

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, EDITOR

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

Production and Profits Depend Upon Power

MANAGING executives, and others in industry should never forget that industrial prosperity depends upon power. Production and profits depend upon labor and capital and management—but the whole structure depends, today, upon mechanical power.

So true is this that you can accurately measure the scale of prosperity of a nation by the number of horsepower employed per worker. It is not the number of human beings engaged in gainful labor, but the number of mechanical horsepower these human beings have to work with, that constitutes the real measure of prosperity.

In the United States, the most prosperous nation in the world today, this ratio is the highest. It amounts to over four horsepower for every man and woman employed in industry.

Only the exceptional man can exert as much as a single horsepower of energy, and this for but a brief interval of time. Picture, then, any modern factory suddenly deprived of its mechanical power supply and compelled to resort to man-power instead. How many men would have to be added to the pay-roll to take the place of that four-horsepower-per-worker? Even granting the impossible supposition that the factory could function under such conditions, what would it cost to maintain the same output?

The substitution of mechanical and electrical power for man-power is the secret of big production and cheap production. It is the secret of increased profits. But more than this, it is the secret of high wages with big buying power. And big production would fall to the ground as *over*-production, without big buying power to sustain it.

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Of two factories making the same product and with the same number of workers, the one that utilizes, intelligently, the greater amount of power will be the more successful from the profit making standpoint.

Thus the aim of every factory executive and of every department head should be to use more power—*intelligently.*

Note the emphasis on the *intelligent* use of power. Intelligent use means effective use.

There is nothing gained by merely paying a bigger power bill.

Whether you buy power from a central station or generate it in your own plant, the whole story is not told until this power is converted into work done at the machine. And between the coal pile and this machine there are plenty of opportunities for the unintelligent use, or waste, of power.

The power chain in even the smaller plant is a long one, with many links. Only a few of these links are under control of the power plant engineer; and the chain as a whole must function efficiently in every link, else profits are wasted.

These sources of waste are shown, link by link, on the accompanying supplement, which shows graphically, for the first time, we believe, the whole story of power, including generation, transmission or distribution, and application.

Millions of dollars are wasted annually in the inefficient generation of power. Dollars lost every day through poor furnace design, bad feed-water, inefficient stoking, wrong combustion—these things, all remediable, mount up to a heavy tax on the power bill.

More millions of dollars are wasted through improper transmission and use. Leaky valves and packings, slipping belts, improper motor capacities, faulty shaft alignment—these and a host of other power-eaters exact an unreasonable toll every hour of every working day.

To save these millions and to conserve this precious profit building commodity—*power*—is the duty not only of the power plant engineer, but of every man concerned with power distribution and application, and this means every one in industry, and particularly, every reader of INDUSTRY ILLUSTRATED.



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DECEMBER, 1925

Industry Illustrated

The Plant Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

In This Issue

Spotting and Stopping the Wastes in Power Generation, Distribution and Application

[For the benefit of those who wish to preserve the supplement we will be glad to send free on request, an unfolded copy of this large chart printed on heavy paper.]

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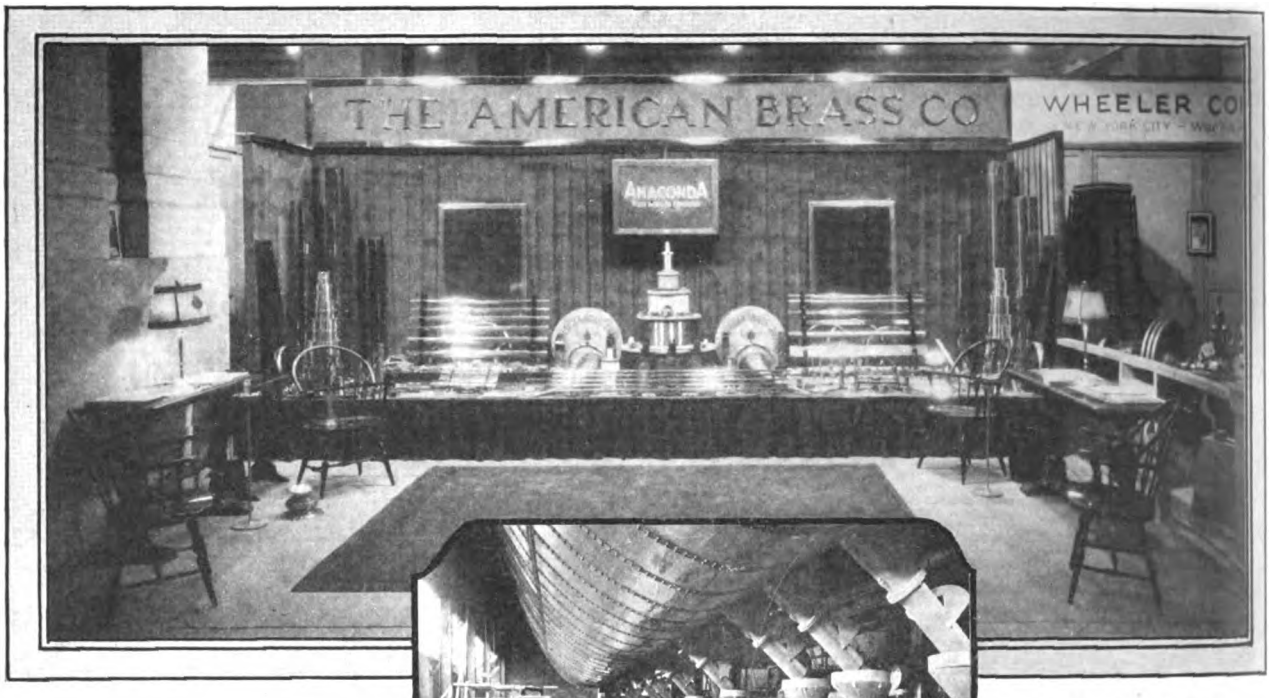
JUST how much value lies in the work of the inspection department of the average manufacturing plant?

Inspection justifies itself, by safeguarding the quality of output. In most plants, inspection also watches jealously the raw materials which are to go into the product. But inspection—intelligently directed—can be made even more valuable.

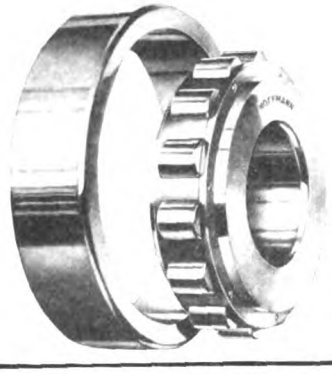
How this can be done—or rather, how one of the largest plants in the country is getting additional dividends from its inspection department—will be told, pictorially, in the leading article next month. The January number of INDUSTRY ILLUSTRATED is, we believe, the closest approach we have yet made to our goal of being the most helpful visitor you ever received in your plant.

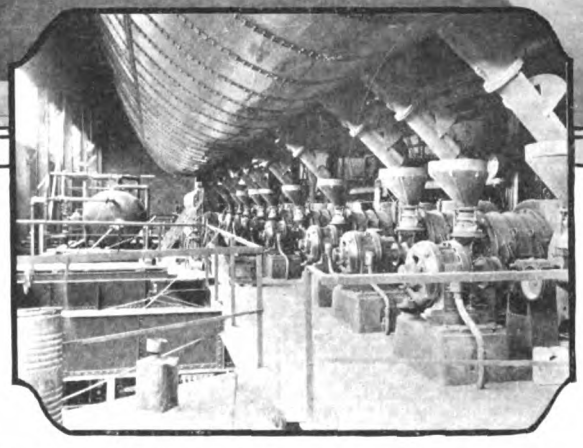
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Seen at the Power Show



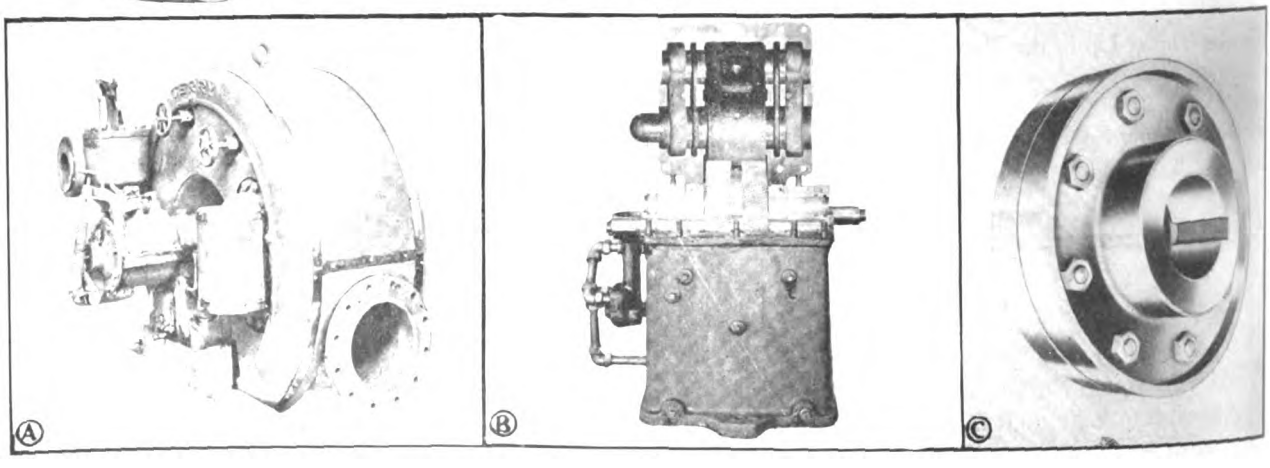
The American Brass Company is exhibiting a full line of Anaconda metal products in the form of sheet, wire, rods and tubes, extruded metal shapes and die pressed metals.





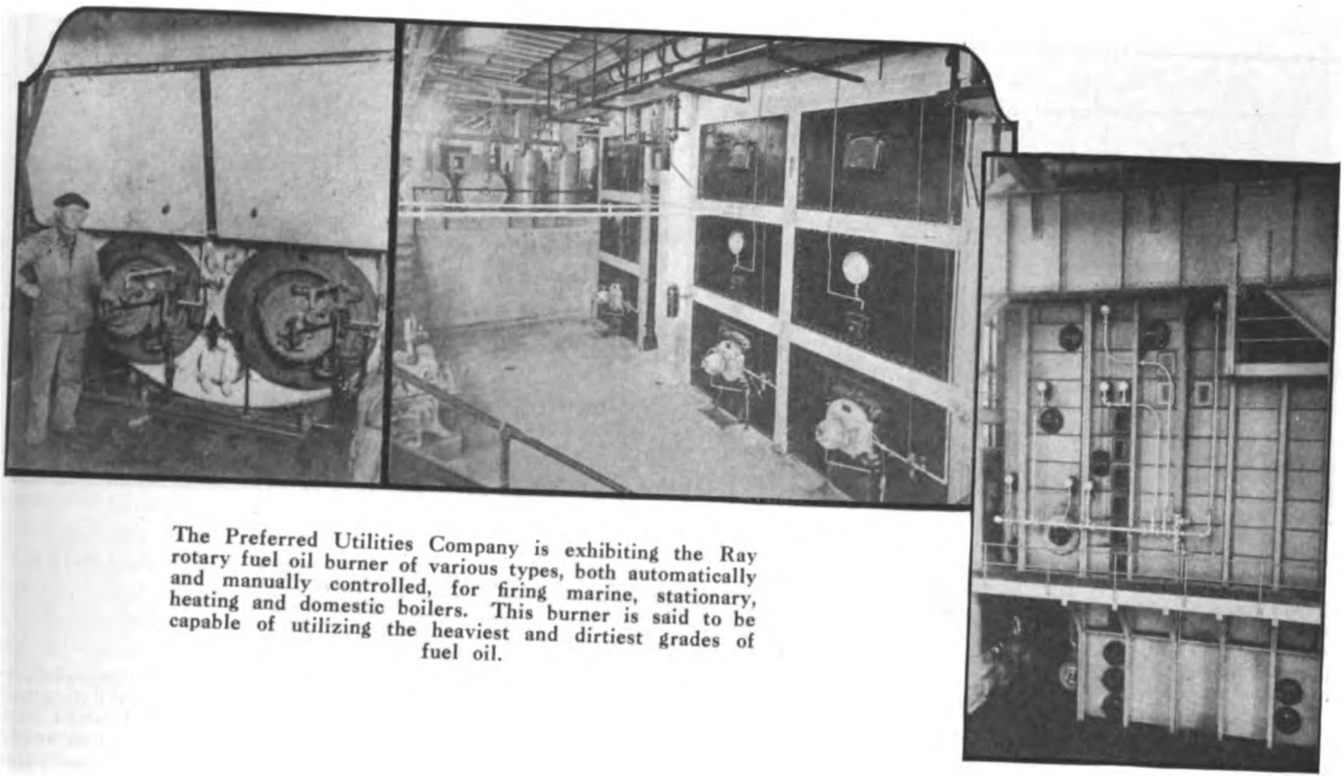
The Norma-Hoffmann Bearings Corporation is exhibiting the "Hoffman" precision roller bearing and also the "Normal" precision ball bearing in open and closed types. The former is illustrated at the left.

The Erie City Iron Works is exhibiting their unit type powdered fuel equipment designed for boiler installations from 150 horsepower up to the largest unit. Pulverizers used in this system are shown in the accompanying illustration.



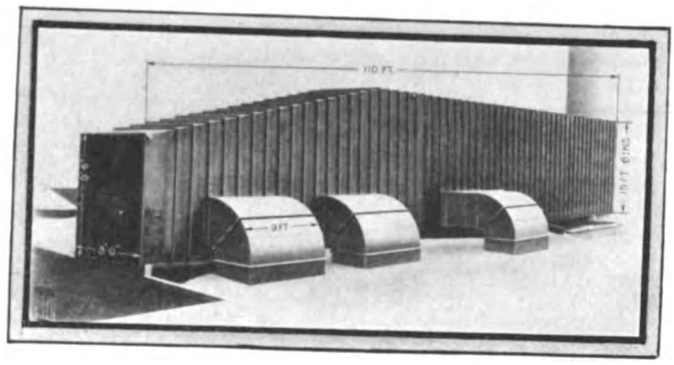
Terry Steam Turbine Company is exhibiting several products, among them are (a) their latest type steel casing Turbine, designed for high steam temperatures; (b) the Terry double helical herringbone reduction gear; (c) the Terry forged steel flexible coupling.

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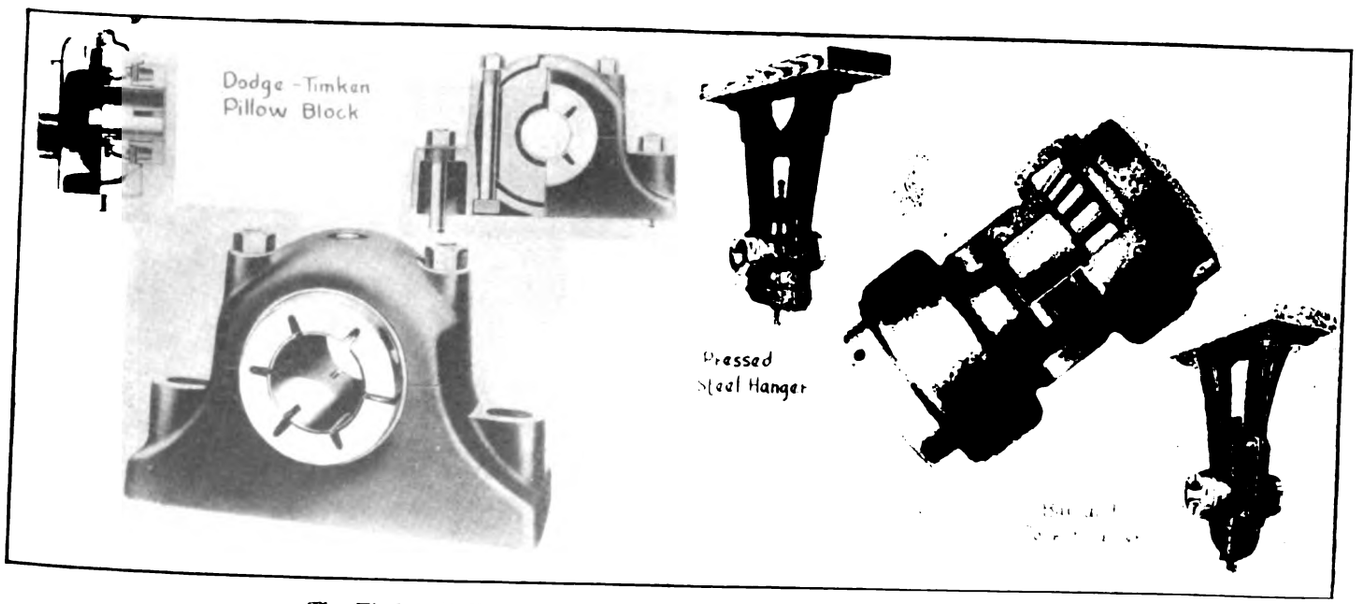


The Preferred Utilities Company is exhibiting the Ray rotary fuel oil burner of various types, both automatically and manually controlled, for firing marine, stationary, heating and domestic boilers. This burner is said to be capable of utilizing the heaviest and dirtiest grades of fuel oil.

Connery & Company is exhibiting breechings and air ducts constructed with improved expansion stiffeners and electrically welded throughout, shown in the accompanying photograph, and also their air cooled damper.

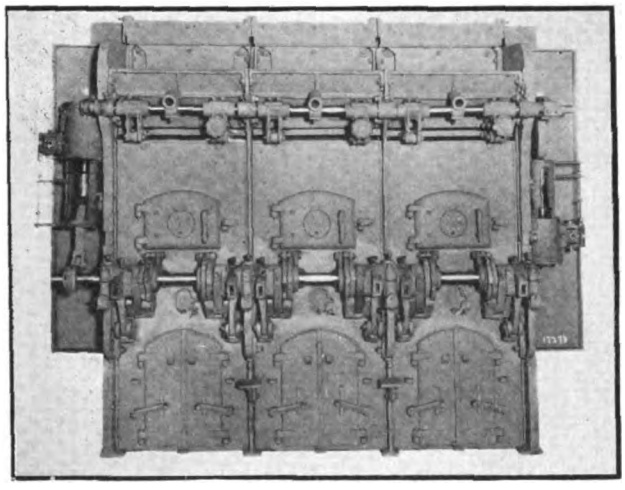


The Vulcan Soot Cleaner Company is exhibiting their self-contained Vulcan valve operating head and the latest developments in Vulcan soot cleaners, particularly improved ratchet operating heads and high temperature heat-resisting soot cleaner elements.

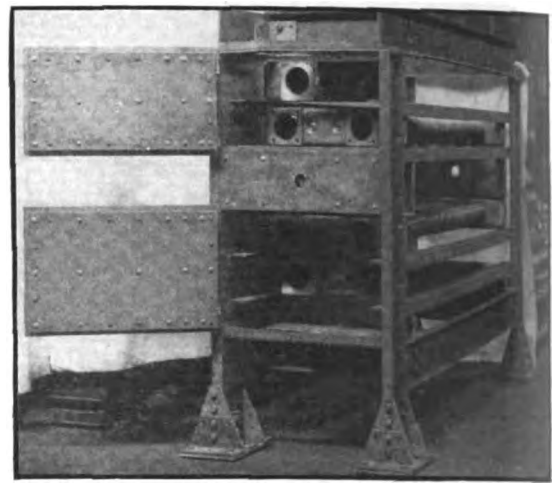


The Timken Roller Bearing Company is exhibiting its improved type of tapered roller bearings together with Dodge-Timken pillow blocks and hangers equipped with these bearings.

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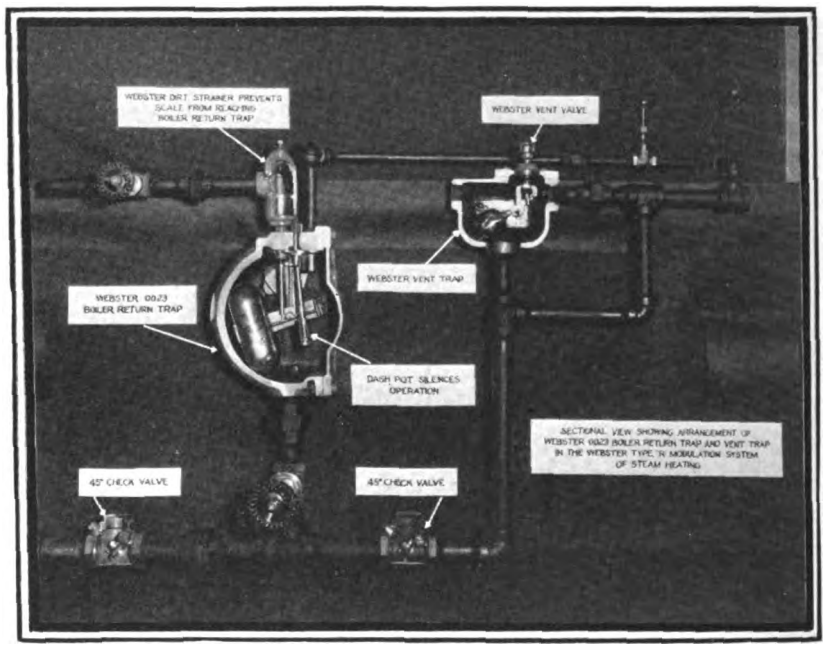


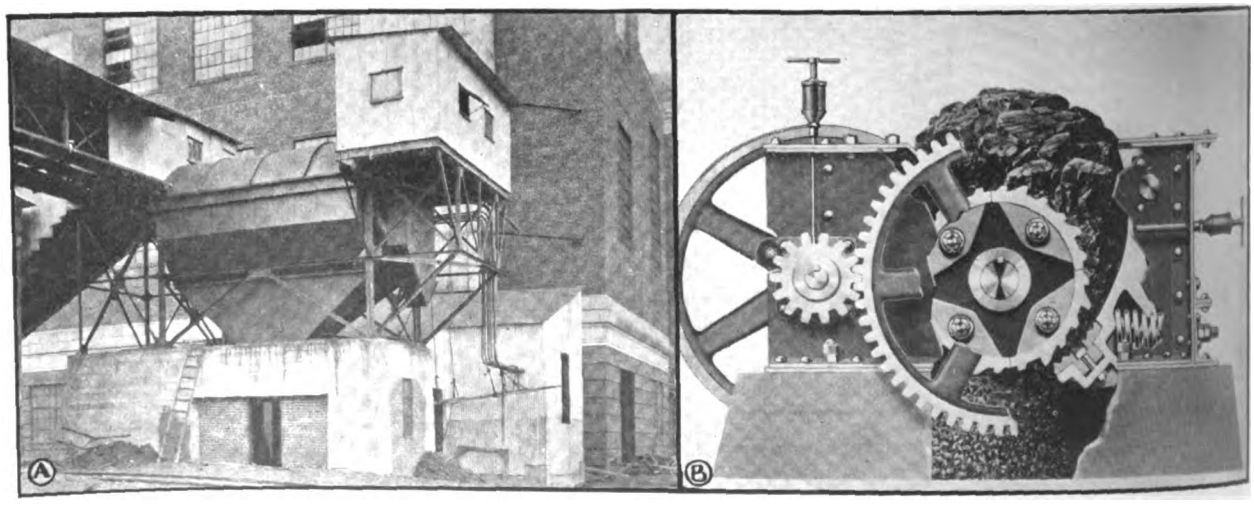
Flynn and Emrich Company is exhibiting the Huber semi-mechanical stoker for natural or forced draft.



B. F. Sturtevant Company is exhibiting their new lead coated economizer, new air heater, turbine driven forced draft fans, turbine driven pumps, cinder-vane fans, motors and air washers for generator cooling. A view of the skeletonized economizer is shown above, and is said to save the customer from ten to fifteen per cent. on his yearly fuel bill.

Warren Webster & Company is exhibiting the Webster type "R" modulation system for industrial plants which purchase their power but use the low pressure or vapor system for steam heating. The mechanical details of the apparatus involved are shown at the right.





Pennsylvania Crusher Company is exhibiting a model of their Bradford breaker showing the actual method of crushing, cleaning and sizing bituminous coal for stokers, pulverizers and gas making. A typical breaker and cleaner installation is shown at a, and sectionalized single roll crusher at b.

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Why the Right Type of Motor Reduces Power Costs

By R. H. Rogers

Industrial Engineering Department, General Electric Company

WITH such a varied assortment of motor characteristics to choose from, that those who apply motors must diligently study the job and the motors to the end that the power unit and the load may be coördinated to lasting advantage. Motors once installed, unless gross misfits, go on with their duties year after year—if well chosen, all well and good, but if ill adapted, they exact continuous penalties, often in obscure but nevertheless sizable ways.

The examination of motor characteristics as to their fitness for certain jobs must include many items. The jobs themselves must be scanned from many viewpoints that the jigsawed characteristics of the job and motor may fit snugly together.

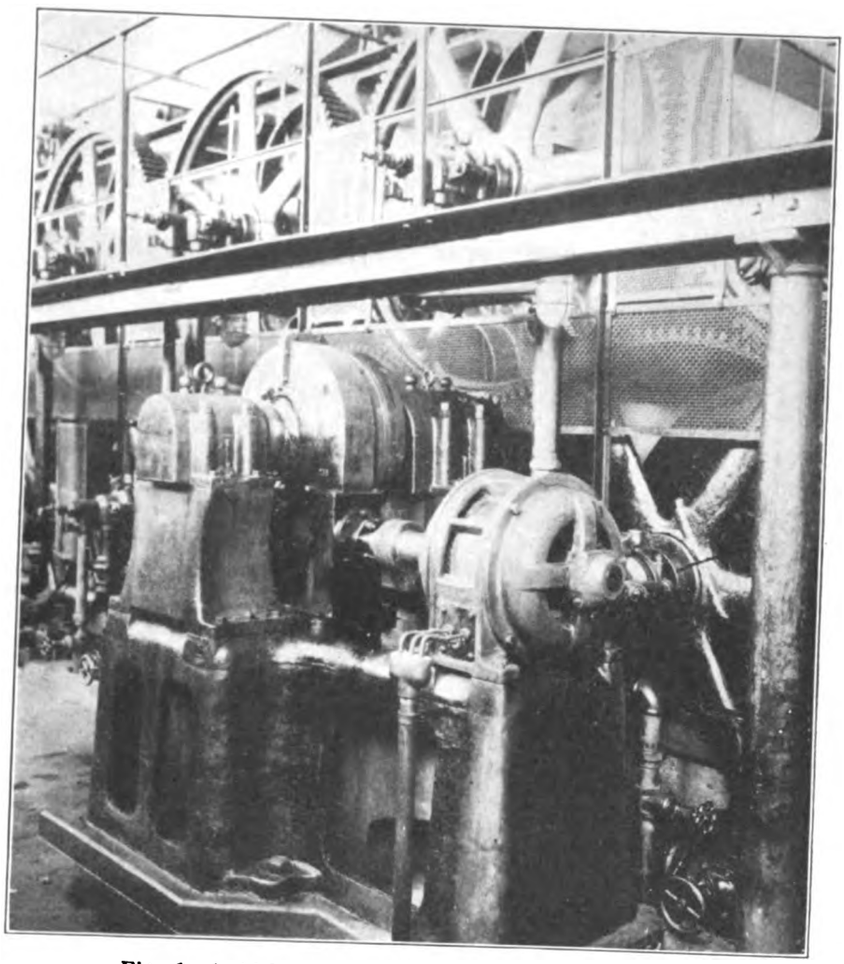


Fig. 1. A high geared alternating current motor for inching and slow running for the dryer section of a paper machine. The main driving unit is a large direct current motor, but alternating current is used here, to have power available on Sundays without running the 500 kw. D.C. turbine set.

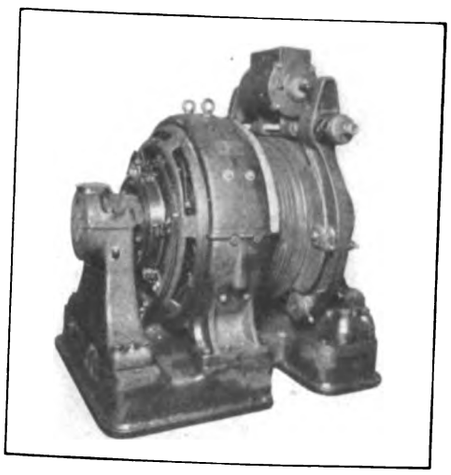


Fig. 2. Above—a massive slow speed, direct current, gearless traction elevator motor, running at sixty-five revolutions per minute. Such motors are subject to starts and reversals as fast as 400 per hour.

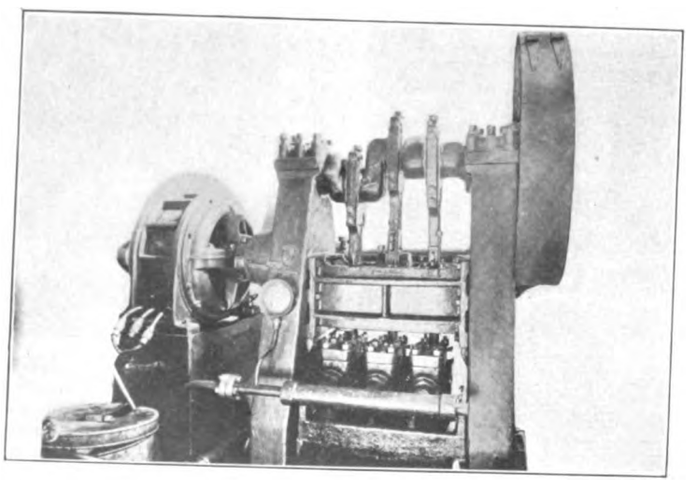


Fig. 3. At the left—A wound rotor induction motor driving a reciprocating pump. Here is a drive with heavy starting duty; which determined the selection of this general purpose motor.

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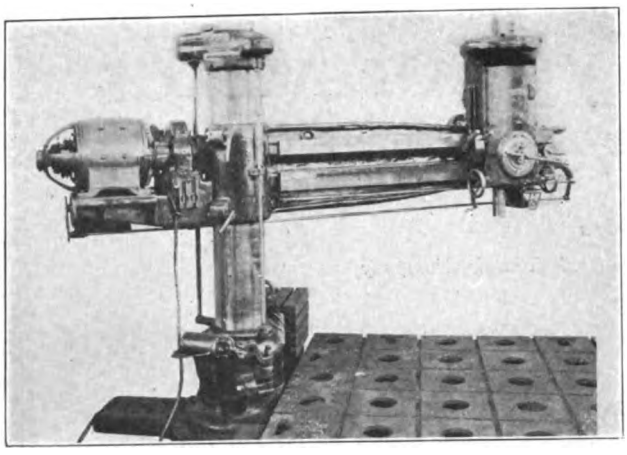


Fig. 4. Above—a radial drill, driven by a shunt wound, direct current motor, with close adjustment of speeds between 450 and 1,800 revolutions per minute. The controller operates through a splined shaft.

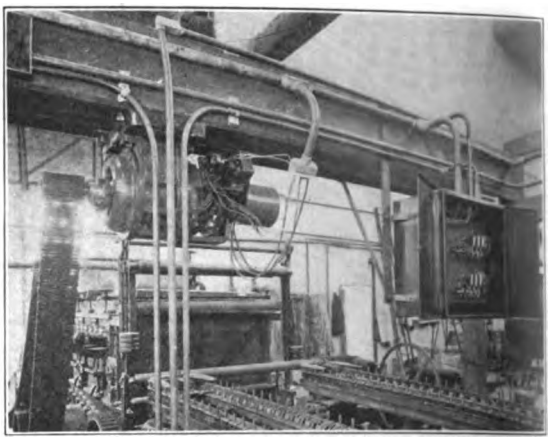


Fig. 5. Above—a commutator alternating current motor, driving a mercerizing range in a textile plant. Speed adjustment is obtained by means of the pilot motor for shifting the commutator brushes.

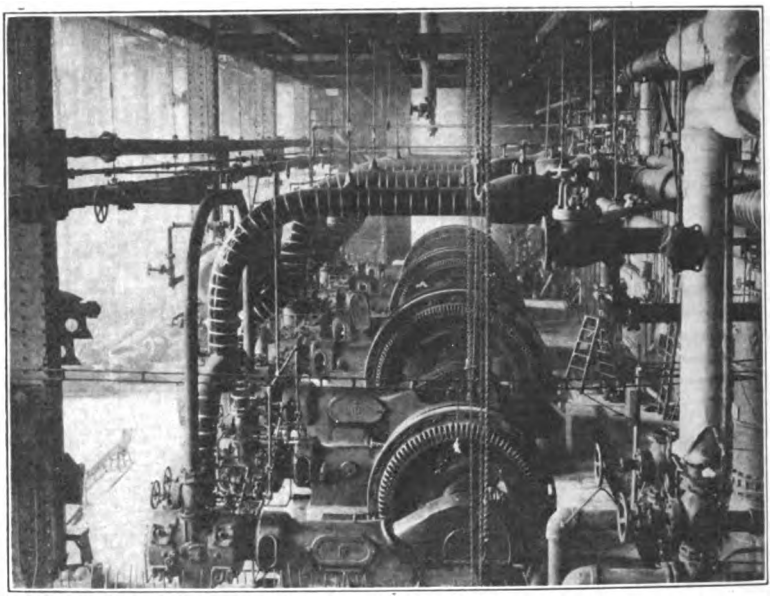


Fig. 6. Above—Slow speed synchronous motors, driving ammonia compressors in a refrigerating plant. Such motors are designed for 80 revolutions per minute, or even less. Synchronous motors not only avoid the low power factor characteristic of slow speed induction motors, but improve the power factor of a system.

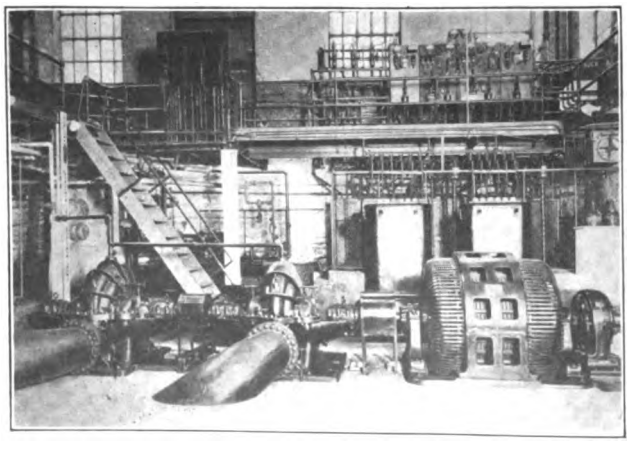


Fig. 7. A synchronous motor, driving centrifugal pumps in a municipal plant. Light starting duty, constant speed, high efficiency, and special power rate for high power factor, determined this choice.



Fig. 8. A typical installation of squirrel cage induction motors in an automobile factory. Such motors are found everywhere in the industrial world. Here, they are driving gear cutters, and are not controlled by push-button.

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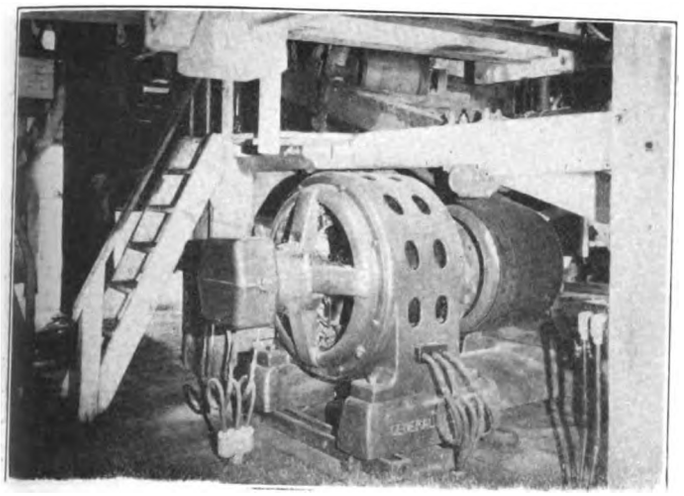


Fig. 9. Above—a 300 horsepower wound rotor induction motor, driving a band head saw in a saw mill. For this work, constant speed service, large size, and rather severe starting duty determined the choice of this type motor.

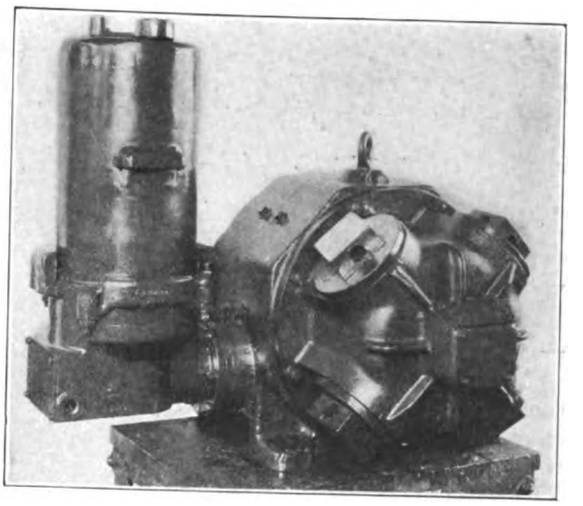


Fig. 10. Above—Here is shown a "permissible" motor for driving the pumps in a gaseous mine. Both the motor and its control are so designed as to be incapable of igniting any surrounding gases.

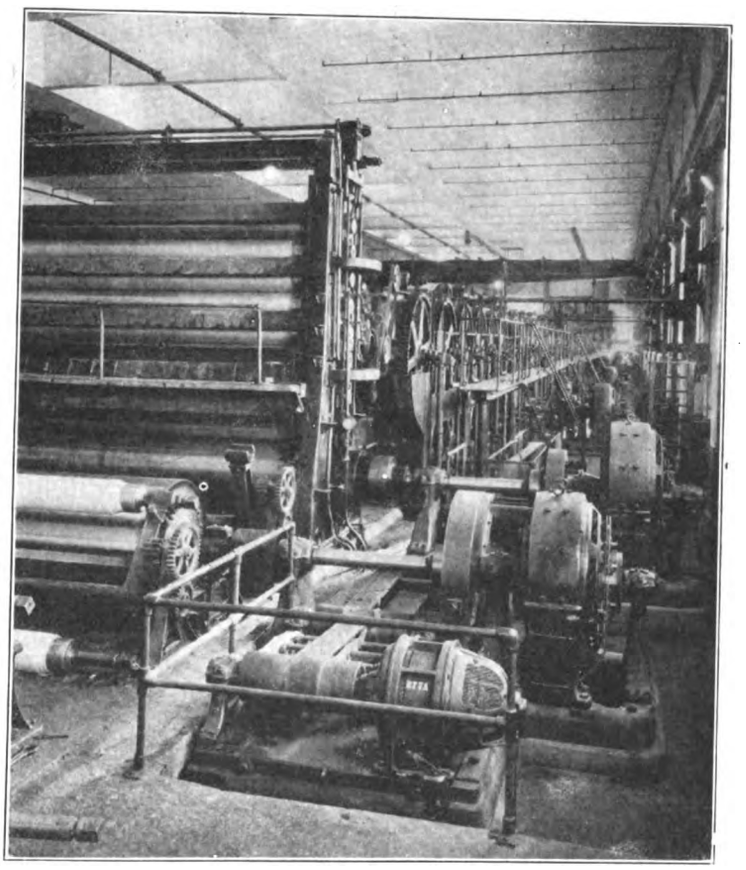


Fig. 11. At the right—Here is a group of motors driving sections of a paper machine, with different but precisely related speeds. Direct current, adjustable speeds by generator voltage control, and synchronous "tie-in" for speed relations, are used here.

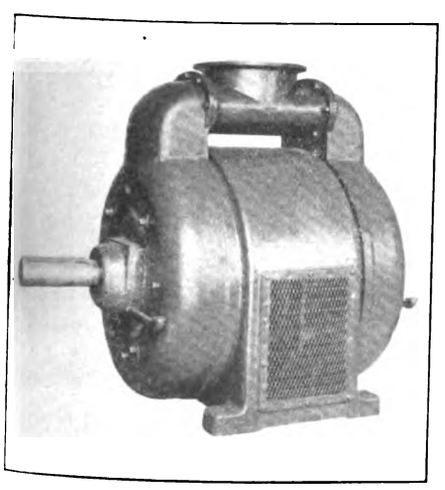


Fig. 12. At the left—A ventilated squirrel cage induction motor for chemical and similar plants. Air is forced, from outdoors, through the motor and out through the screens.



Fig. 13. Below—Steel mill conveyor motors, with spring-set, solenoid-released brakes to prevent running back with a load on the conveyor. These motors, operate bundle conveyors between the rod and wire mill and the cooling conveyors.

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Gravity Cuts This Plant's Power Bill

Taking Advantage of Topography to Reduce Handling Costs

By Matthew W. Potts

MUCH has been written on how to use mechanical equipment for handling coal and ashes within a boiler house, but very little has been written to show how a boiler house of medium size capacity can be built so that coal and ashes can be handled economically without using some form of conveying equipment. For this reason the Hammermill Paper Company's power plant at Erie, Pa., presents a unique layout to accomplish the handling of coal and ashes with a minimum of materials handling equipment. To give a complete story of this layout, six photographs are presented to illustrate the building and equipment, but it will also be necessary to give our readers a little history dealing with the reasons for selecting these novel methods of coal and ash handling.

When it was decided to build a new power plant at the Erie Works the engineering department of the company endeavored to select a location which would interfere as little as possible with the present layout of production buildings, and which would also fit in well with any future plant expansion. At the same time it was necessary to locate the power house so as to be convenient of access, and with the idea in mind of conveying the coal and ashes ecconomically. A boiler house, and power plant already in operation was located in the center of the plant. A centralized coal storage area was also in existence, and these two factors had to be given consideration in connection with the new power plant building location.

Investigation of sites disclose the fact that in one portion of the plant property, which was located on the lake front, there was a considerable depression, part of which was natural formation, and some of which had been excavated to supply fill for another portion of the plant property. It was found, after a little study, that to deepen the excavation would not be very difficult, and a solid rock foundation could be obtained for the stack. This location was ideal for the distribution of steam and power, and fitted in well with the general plant layout.

Preparation of plans showed that with some additional excavation the top of the new boiler house coal bunker would be on the same level as the existing plant

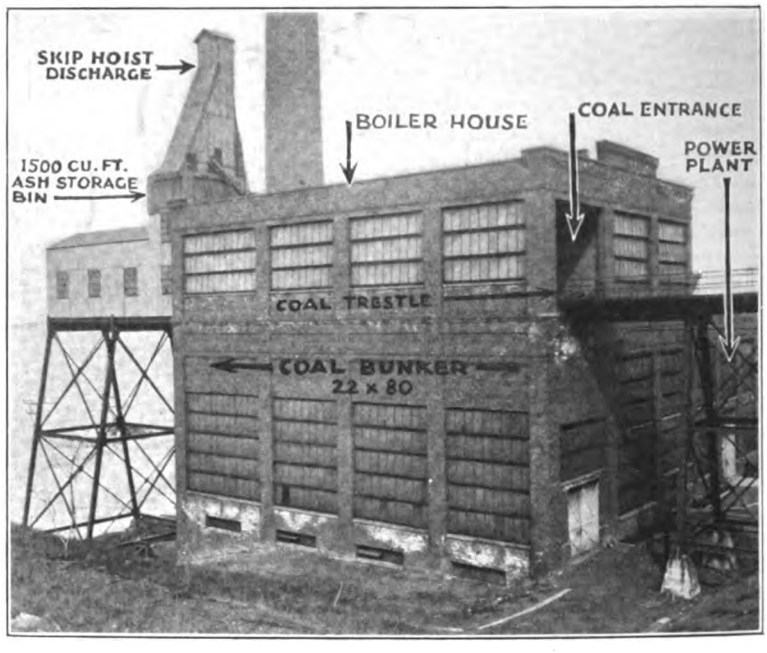


Fig. 1. General view of power house showing coal car entrance, ash skip hoist and method of trestling.

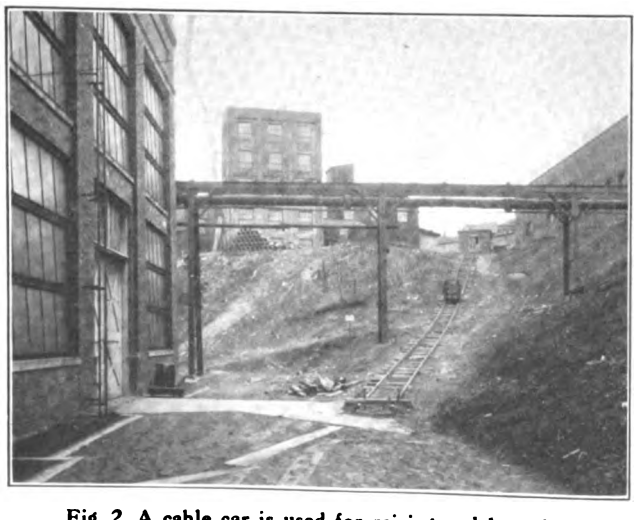


Fig. 2. A cable car is used for raising and lowering equipment and repair materials required in the power pl



Fig. 3. With a system of gates and spouts, coal is fed from overhead bunkers direct to stokers without being handled.

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View in Enameling Dept. Studebaker Corp., South Bend, Ind.



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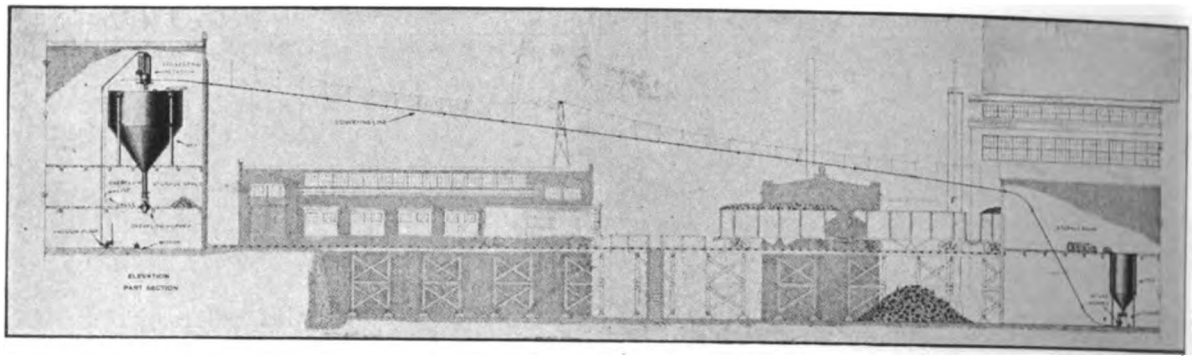
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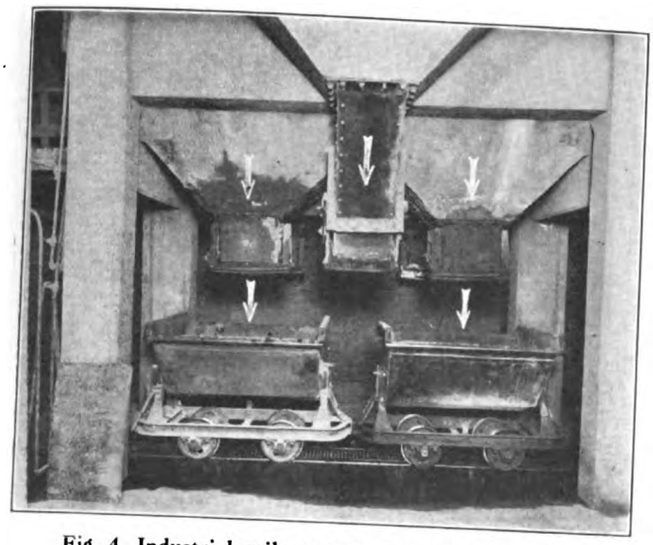


Fig. 4. Industrial railway cars pass directly under the ash pits and are loaded by simply opening the gates.

property and buildings. It was then determined that by building a short steel trestle the incoming coal track could be extended directly over the coal bunker, making it possible to discharge coal direct from railway cars to bunkers without the necessity of providing any form of conveying equipment for rehandling. A portion of this trestle, a general view of the new power plant, and the entrance door for coal are shown in Fig. 1. The relation of the new building to the other plant property in regard to elevation is shown in Fig. 2.

As previously stated, the large coal storage of the company was already established. Here the coal is loaded direct to dump bottom cars by locomotive cranes, and transferred by company locomotives to the boiler house being described in this article, and to the old boiler house located in the center of the plant. In order to have a sufficient supply of coal within the new boiler house an overhead steel bunker, approximately 22 feet wide and 80 feet long, is located as shown in Fig. 1. This bunker has a capacity of approximately 500 tons. To fill the bunker, the cars are spotted on the trestle and dumped by gravity in a very few moments.

Within the boiler house the idea of conveying coal by gravity is again used, and Fig. 3 shows a portion of

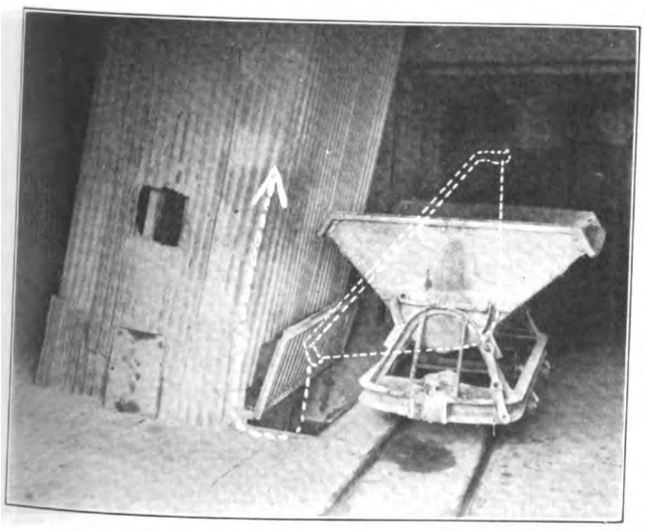


Fig. 5. The dumping of ashes from industrial railway cars to skip hoist is quickly accomplished. This shows the skip hoist feed point.

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Fig. 6. A small ash storage bin is filled direct from the skip hoist. By opening the gate these ashes are dropped direct to railway cars, as shown.

the overhead steel bunker with gates, and spouts for feeding the coal direct to stokers. It will be noted that four boilers are in operation in this plant, and these have a daily average consumption of approximately thirty-one tons each. With this method of feeding the coal, no conveyors are used, and the boiler room attendant operating the stokers also takes care of the coal handling by simply opening the bunker gates by means of chains which extend to the floor. It has been found that with this method of handling coal the labor cost is reduced to a minimum, and it is estimated that the labor cost of handling a ton of coal from cars to stoker feed point is approximately five cents.

For handling ashes gravity is again employed, and each boiler pit is equipped with five undercut gates, as shown in Fig. 4. Directly beneath these gates are two runs of narrow gauge industrial tracks upon which industrial cars operate. When it is desired to unload any boiler ash pit, the same man who has formerly been occupied in placing coal in the overhead bunker is sent to the basement of the boiler house, and by simply opening the gates he is able to load the cars without shoveling or rehandling. Both runs of industrial tracks are switched into a common track at one end of the boiler house, and this track passes directly in front of a skip hoist feed opening. With this layout, the man, after filling the car, pushes it to the skip hoist, and by throwing the safety latch is able to dump the car direct to the skip hoist bucket. By pushing an electric button, the skip hoist raises the load of ashes and discharges same to a 1,500 cubic foot concrete ash storage bin, as shown in Fig. 1. From here, the ashes are readily discharged by gravity into railroad cars on the tracks below.

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Mechanical Transmission Appliances that Cut Power Costs



Fig. 1. Driving the producing machine at its proper speed means saving power. Speed reducers enable both driving and driven apparatus to run at their most economical speeds. Above is shown the herringbone type of speed reducer with top of casing removed.

Courtesy Poole Engineering and Machine Co., Baltimore, Md.

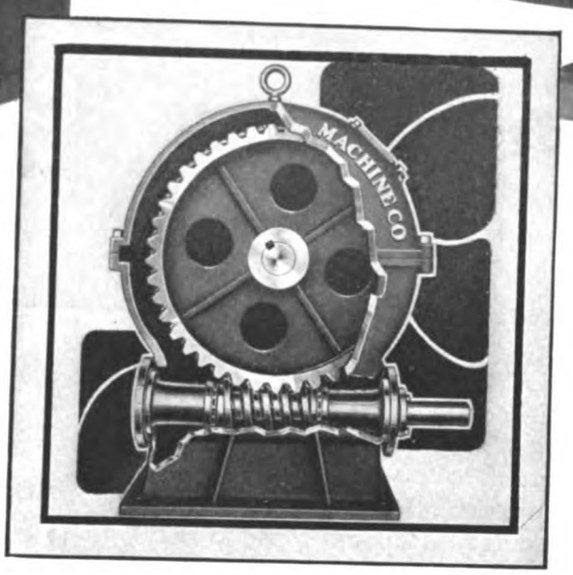


Fig. 2. Where comparatively slow speeds are desired on the driven shaft, worn gear reduction units are extensively used. The ratio of reduction will range from 50 to 80 per cent.

Courtesy Foote Bros. Gear and Machine Co., Chicago, Ill.

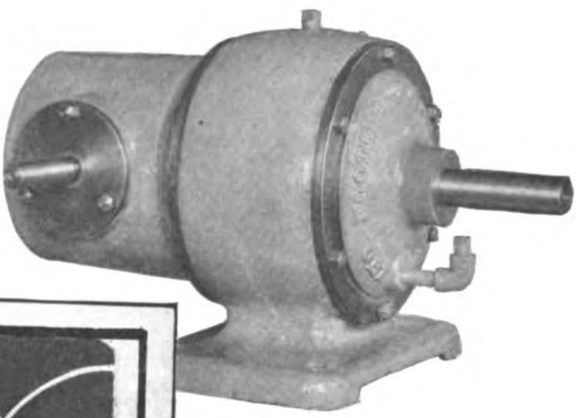


Fig. 3. Spur gear speed reducers are made in both planetary and non-planetary designs. One of the latter type, with right angle drive, is illustrated above. It is built for either vertical or horizontal drive. All parts operate in a bath of oil.

Courtesy Foote Bros. Gear and Machine Co., Chicago, Ill.

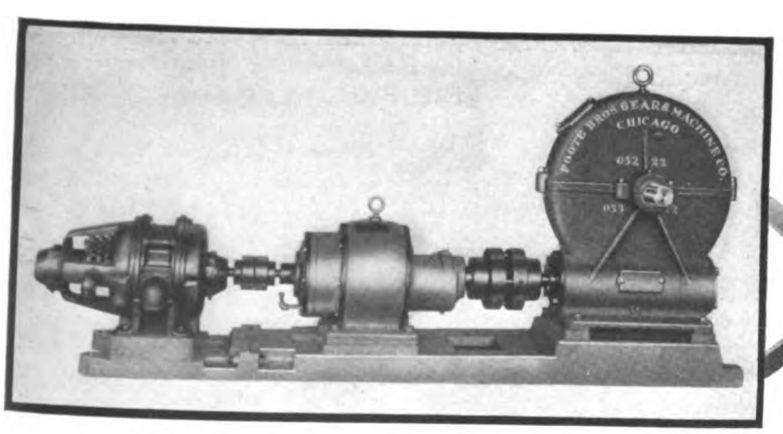
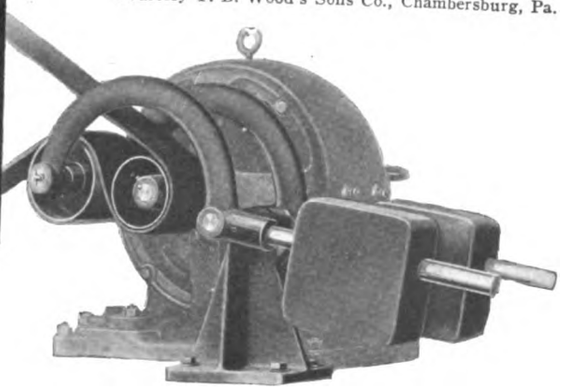


Fig. 4. There are many applications where extremely slow speed is required as, for example, for assembly conveyors, continuous ovens, and glass factory Lehrs. In such cases a combination set consisting of spur gear reducer direct connected to a worm gear reducer, will give ratios as high as **100,000 to one, if desired.**

Courtesy Foote Bros. Gear and Machine Co., Chicago, Ill.

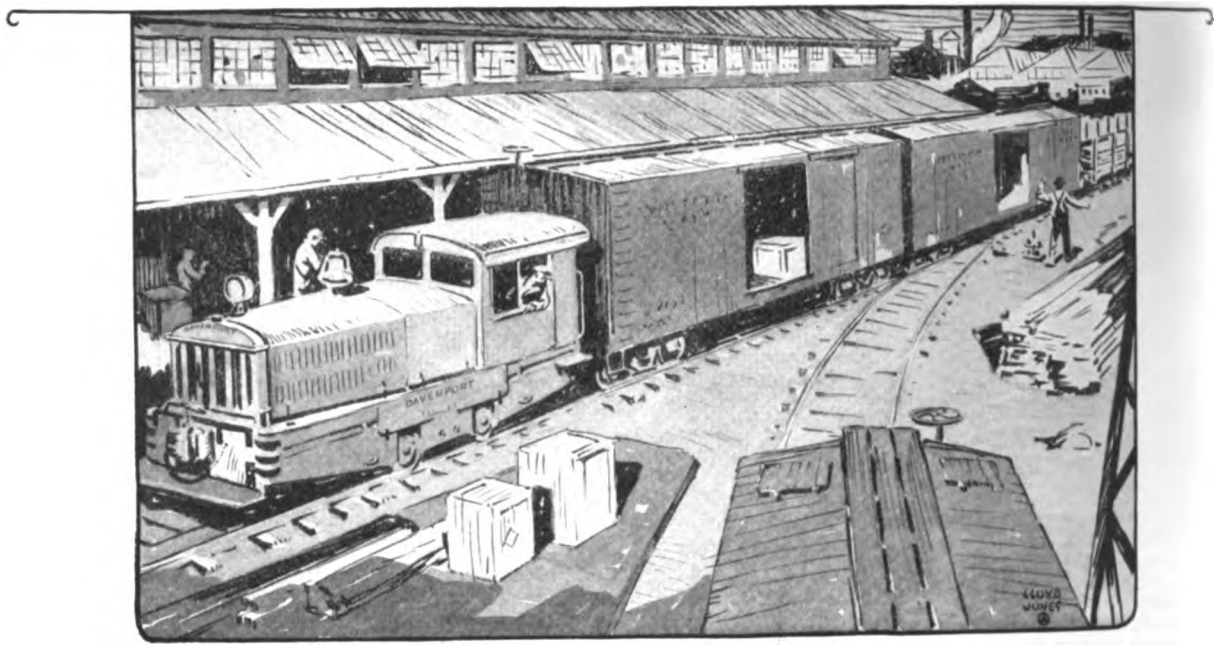
Fig. 5. By increasing the arc of contact as the load increases, this automatic belt contactor enables short center drives and the use of small driving pulleys.

Courtesy T. B. Wood's Sons Co., Chambersburg, Pa.



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Fig. 6. Line shaft friction is responsible for great power wastes due to misalignment, improperly oiled bearings, etc. The installation of anti-friction bearings causes a considerable drop in power consumption.

Courtesy Hyatt Roller Bearing Co., Newark, N. J.

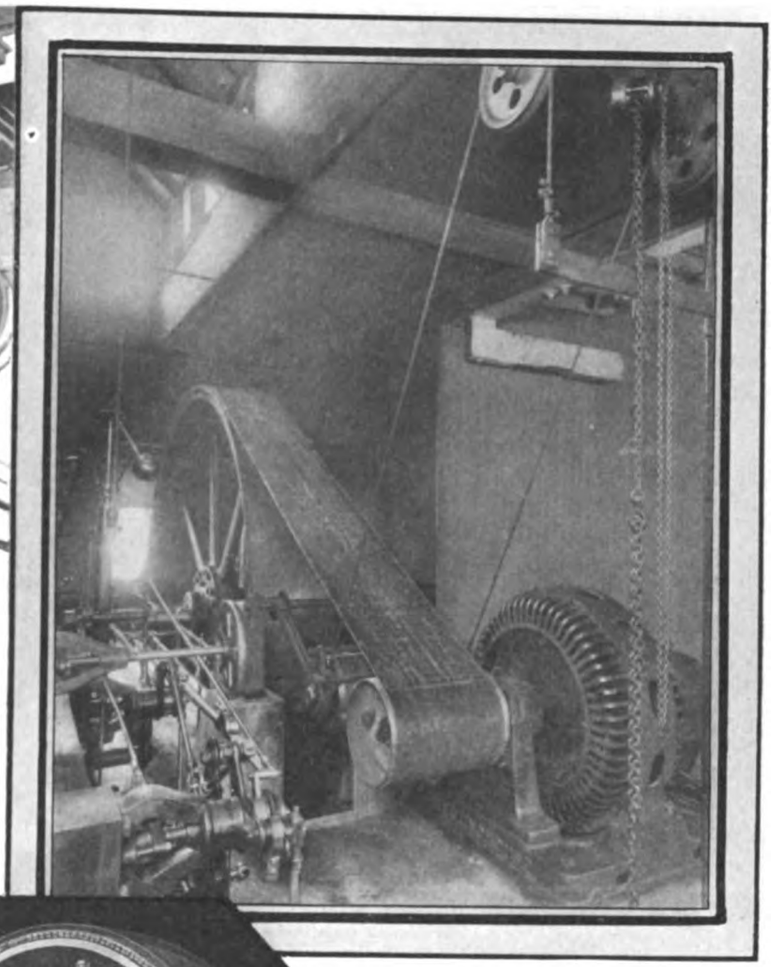


Fig. 7. By means of this Lenix drive it is possible to obtain an efficient drive from the 18-foot engine flywheel to the 22½ inch generator pulley, a ratio of nearly one to ten with 16-foot pulley centers. A great saving in floor space is thus effected as well as securing a highly efficient drive.

Courtesy F. L. Smidth & Co., New York

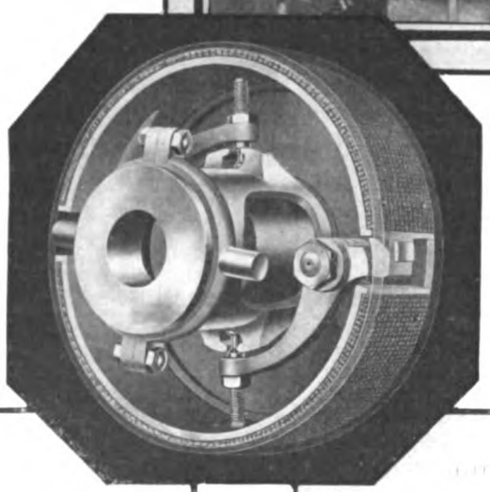


Fig. 8. The friction clutch is an important power saving mechanism. When properly applied its use relieves unnecessary friction or idle loads. One of the newest on the market is illustrated above.

Courtesy The Wolf Co., Chambersburg, Pa.

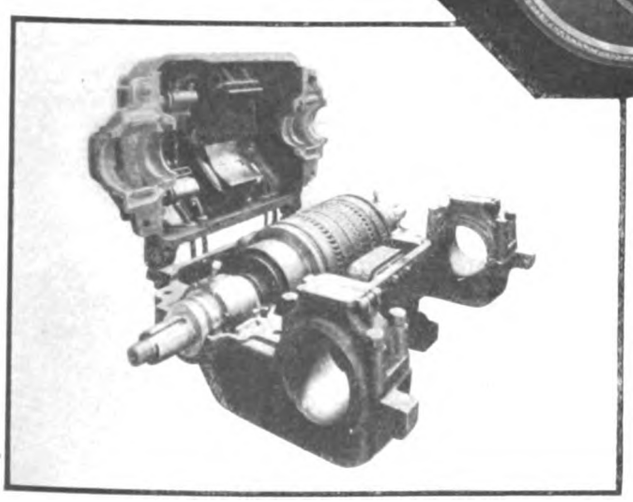


Fig. 9. Motors as well as other apparatus with rotating parts are now frequently equipped by their builders with anti-friction bearings.

Courtesy Hyatt Roller Bearing Co., Newark, N. J.

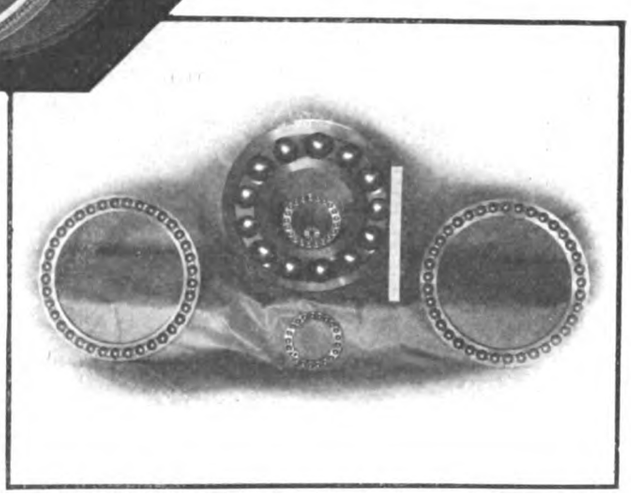
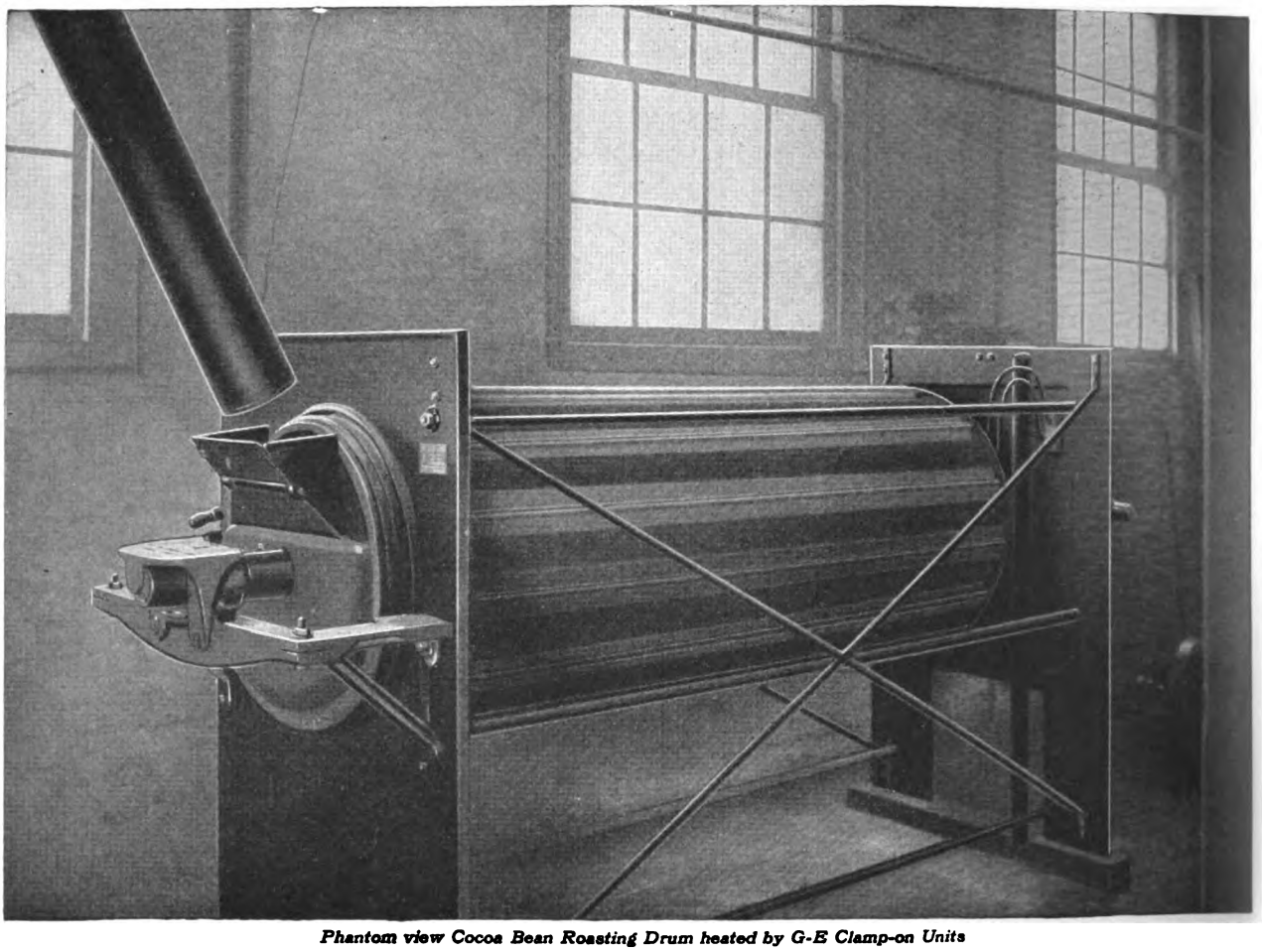


Fig. 10. Ball bearings are now procurable in sizes to meet practically every need in both radial and thrust types as indicated in this picture. The large radial bearing in this picture is approximately 18 inches in diameter.

Courtesy Fan'am Ball Bearing Co., Bantam, Conn.

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How Modern Coal and Ash Handling Cuts Power Costs



Fig. 1. One of the reasons why a locomotive crane effects big saving, is because in addition to cutting down the cost of handling coal, it often finds so many other uses about the plant. This particular crane, for example, finds so many uses in a railway yard that it saved some $18,000 a year in wages; doing work which formerly required 25 laborers.



Fig. 2. Below—The Lakewood & Coast Electric Co., of Lakewood, N. J., found that an overhead cable conveyor best met their requirements for handling fuel to the power house. Long runs are a simple matter, with such equipment.

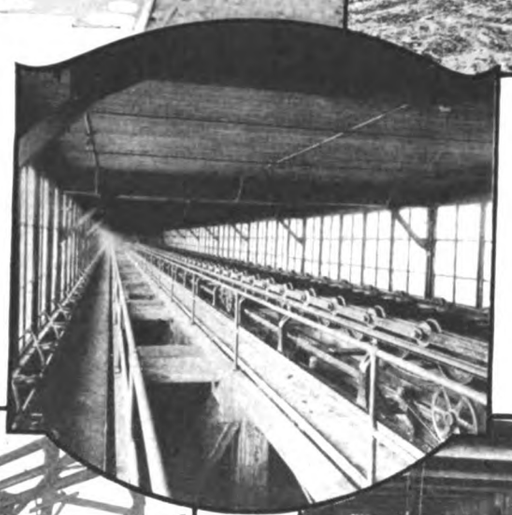


Fig. 3. At the left—Public utility power plants, which treat power as a primary product, naturally are in the forefront in utilizing efficient apparatus for handling their fuel. Here is a part of the overhead carrier for coal to the boilers of the Northwest Station of the Chicago Commenwealth Edison Co.

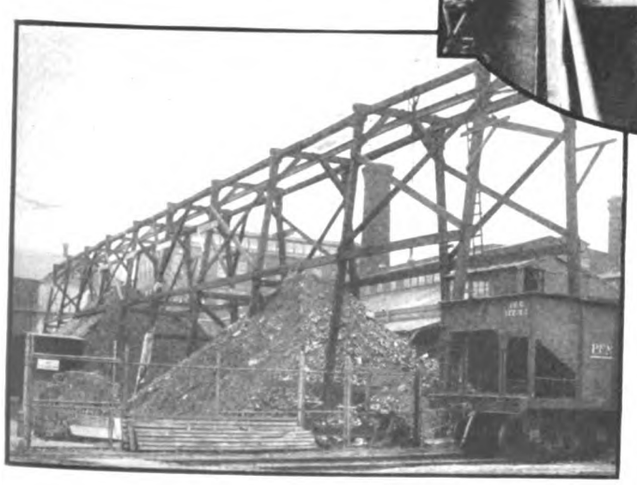


Fig. 4. Here is another overhead cable conveyor installation, located at the Mutual Pottery Co., Trenton, N. J. Note how it permits direct handling of coal from the cars.

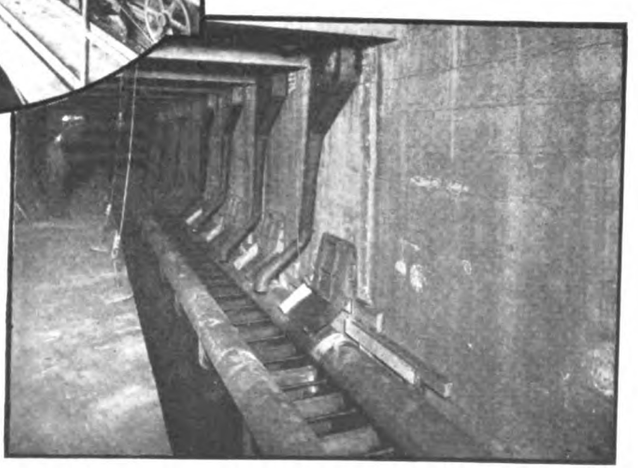
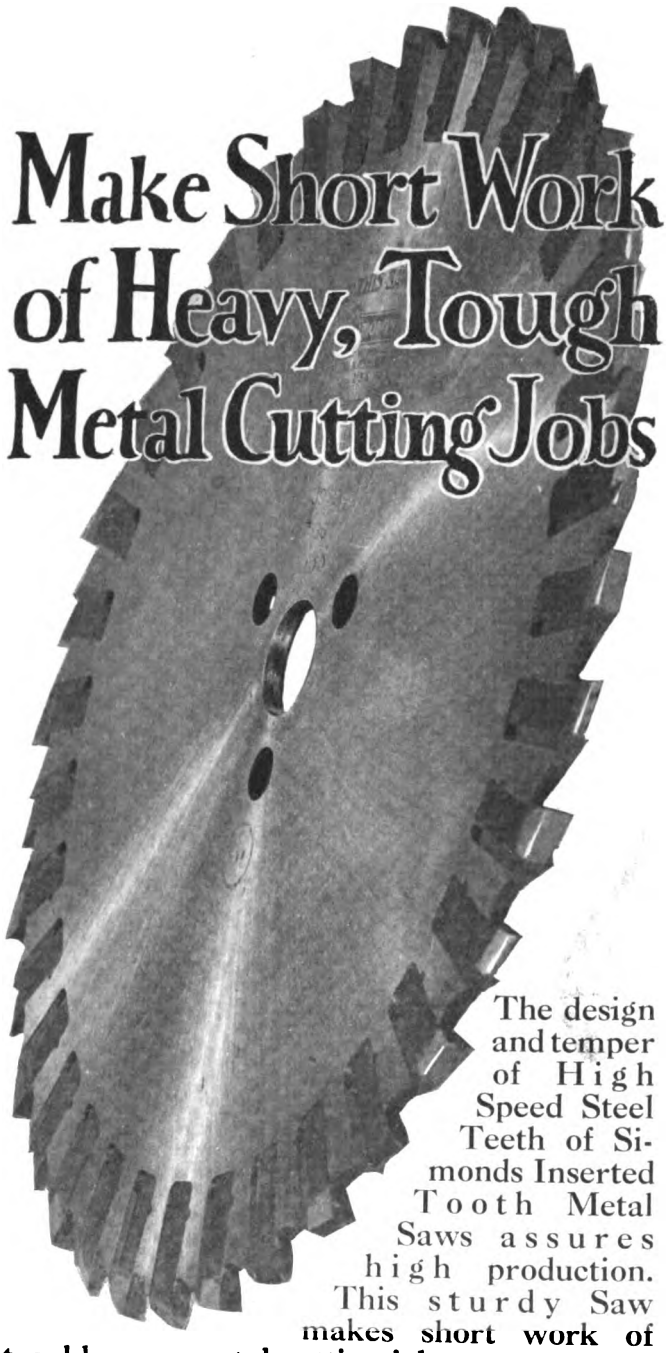


Fig. 5. In many systems of fuel conveyors, it is possible to arrange them so that the upper run delivers coal, while the lower run carries the ashes out to a central point for removal.

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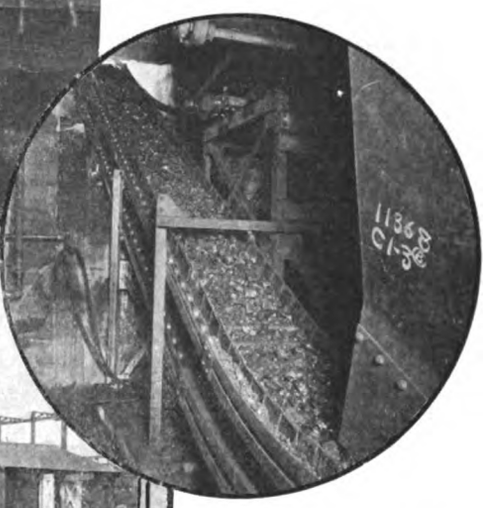


Ferrule Type Knife-Blade Type Gem Plug Fuse

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Fig. 6. Here we have a crane, once more, and demonstrating the fact that it can do more than merely reduce the coal handling bill. Whether it be rock, sand, or coal, the main principle is always to get it moved to destination at lowest cost.



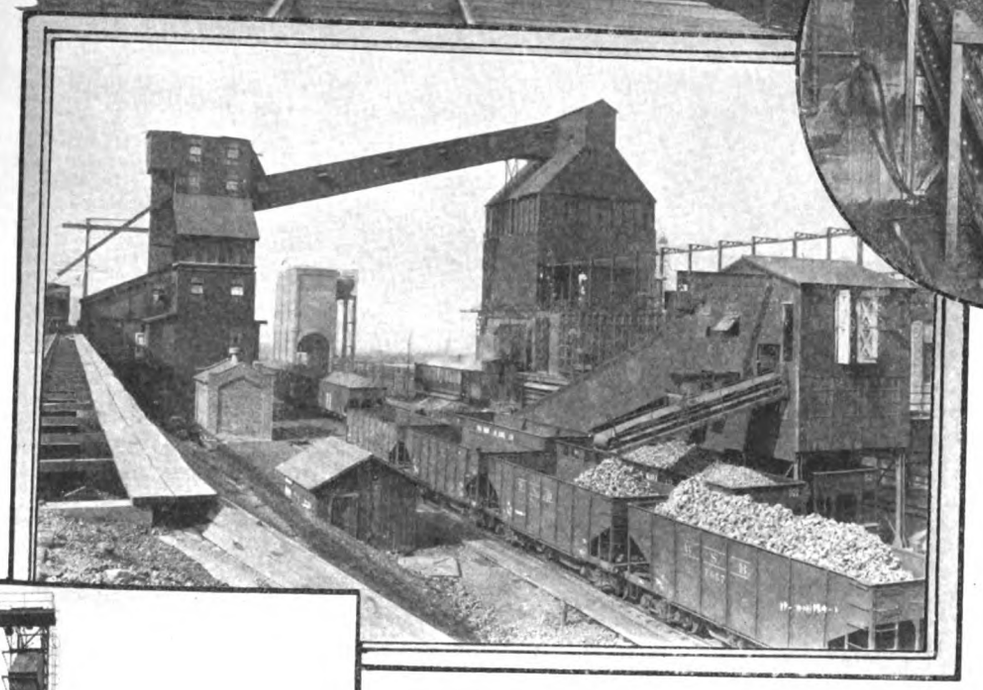


Fig. 7. Here (in circle above) is a beaded flight conveyor which saves the labor and wages of many men, in getting coal from the track hopper and crusher up to storage pits at a steel plant.

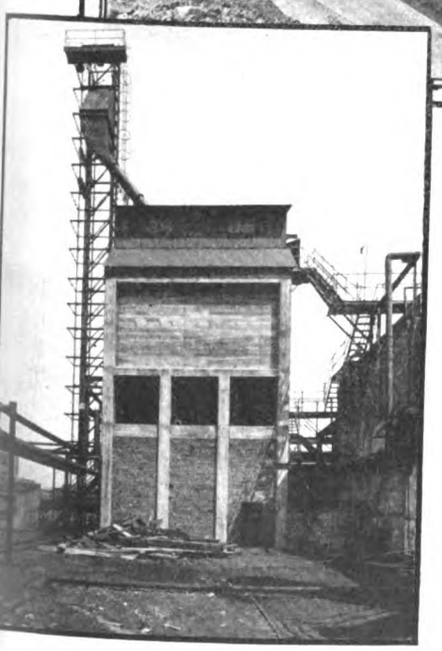


Fig. 8. The by-product coke plants, too, have found it vital to handle their coal by the most economical means. These belt conveyors are installed at the by-products coke ovens of the Diamond Alkali Co., at Fairport Harbor, Ohio.

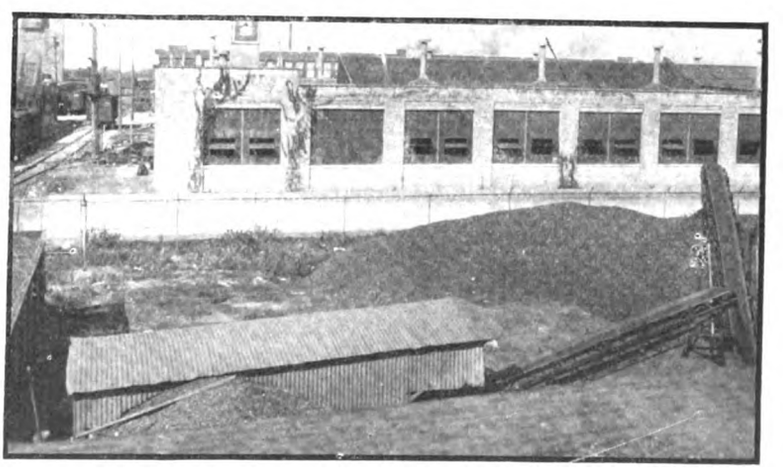
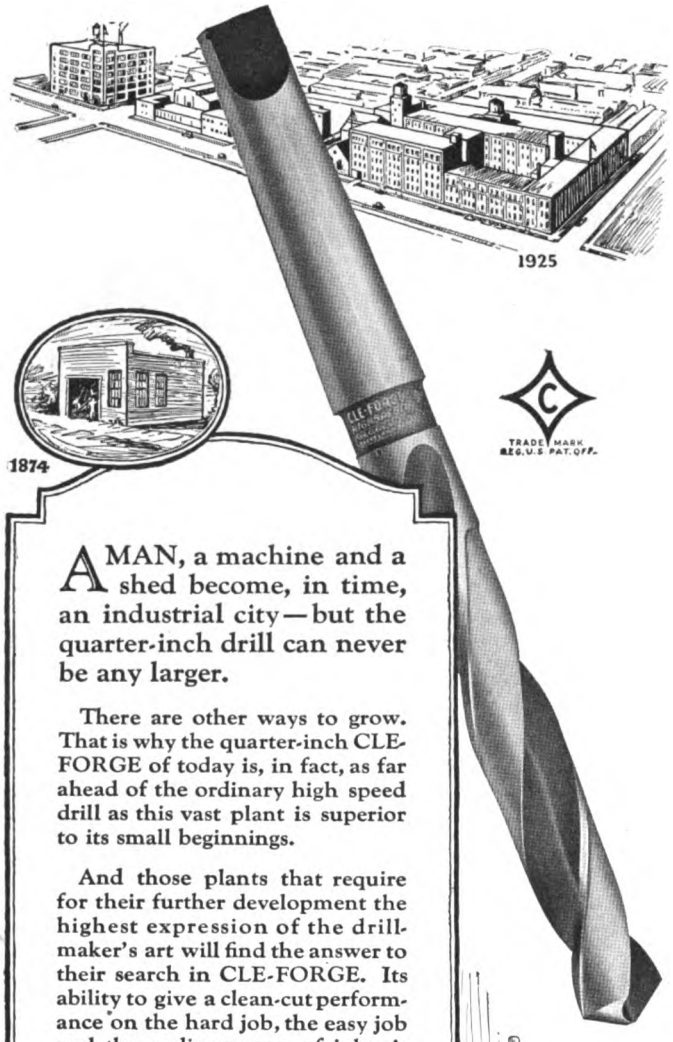


Fig. 9. The skip hoist is another widely used method of handling coal to elevated bunkers. This particular one is of the high speed, automatic type, and elevates run of mine coal from railroad cars to overhead bunkers, at the Atlas Works, Buffalo, N. Y.

Fig. 10. Often, special conditions make an elaborate, fixed installation inadvisable for the handling of fuel. Here, for example, is a view of two portable conveyors transferring coal from a track hopper to storage pile, at the Chicago Flexible Shaft Co.

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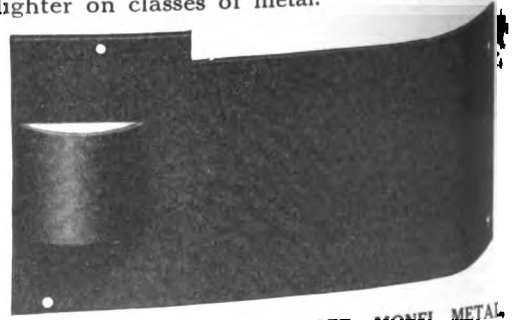
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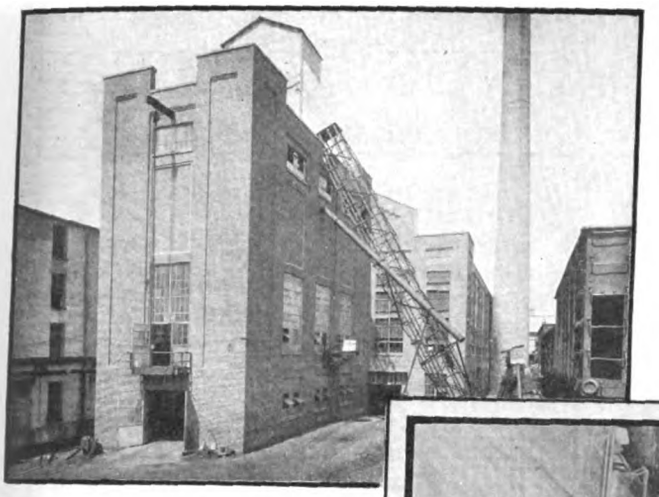


Fig. 11. Above is another skip hoist installation, elevating coal from railroad cars to bunkers at the power house of Keasbey & Mattison Co., Ambler, Pa.—and doing it economically.

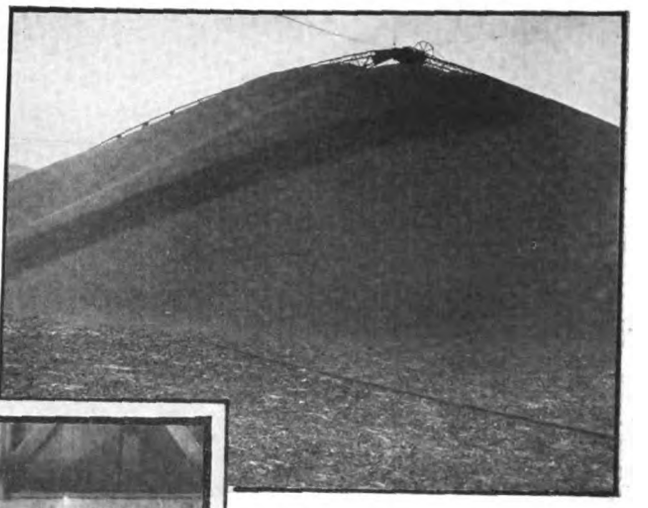


Fig. 12. Here is a mountain—one of many at the same place—of 71,000 tons of coal at the Shadyside storage yards of the New York Edison Co. Here, of course, the huge scale of operations makes necessary the utmost in labor-saving handling methods.

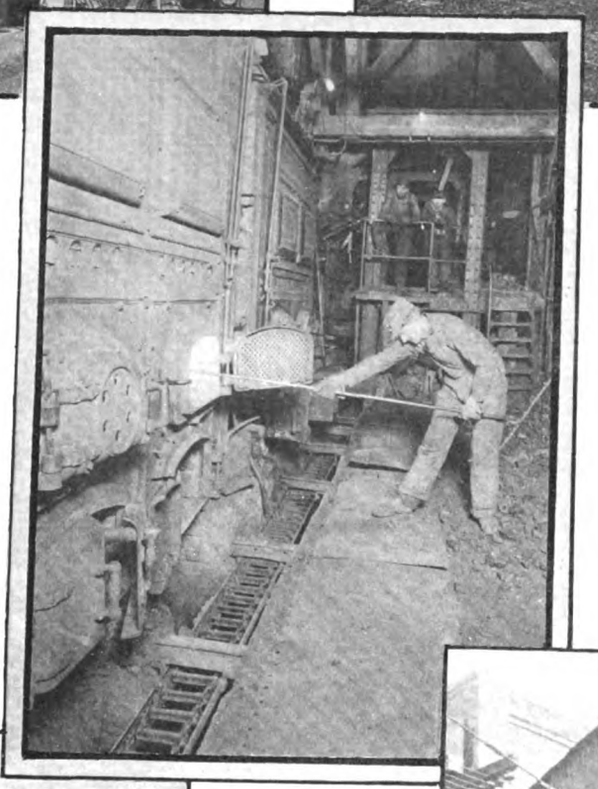


Fig. 13. At the right—Ash disposal, in this power plant, is taken out of the hands of expensive and inefficient labor; the drag chain conveyor taking the ashes away directly from in front of the boilers.

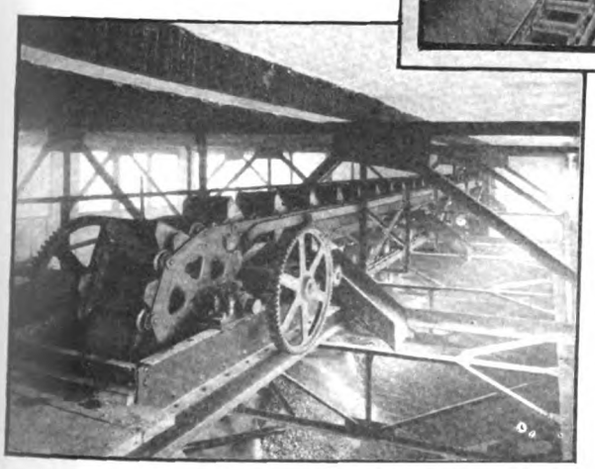


Fig. 14. This view of a V-bucket conveyor gives a clear idea of how such conveyors discharge through spouts to bunkers located above the boilers; whence gravity feeds to the stokers below.

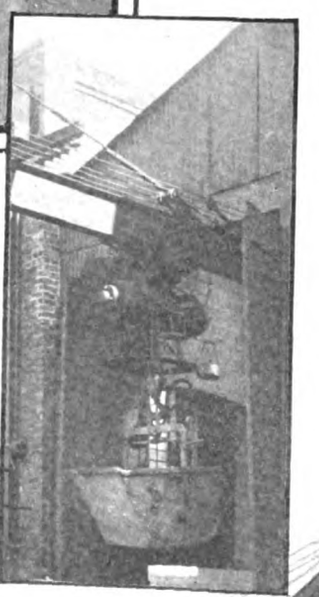


Fig. 16. Here, at the left, is an electric monorail hoist installation which permits running direct to the boiler room. In many plants, such equipment is utilized not only for carrying fuel, but for a host of other handling jobs all over the plant.



Fig. 15. The locomotive crane is not necessarily confined to rails. Here, for instance, is one handling coal, and getting right up into the coal pile to do it.

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Fig. 1. That the shafting and belting system of power transmission is still extensively used, is demonstrated by this illustration of a portion of one of the most modern automobile manufacturing plants in the Detroit section.

The Control of Mechanical Power Transmission

IV—*Transmission Applications and Bearings*

By William Staniar

IN preceding articles of this series, stress has been brought to bear on the importance of proper type and correct size of transmission belting for industrial operations and its direct relation to efficiency, economy and profits. However, it is an obvious fact that belting in itself is worthless as a power transmitter unless it operates in conjunction with suitable transmission appurtenances.

In most all plants of the country, whether they be of the modern or old style construction, the shafting and belting system is the most extensively employed owing to its flexibility as to load and distribution.

Modern plants are as a rule efficiently equipped mechanically for the transmission of power, because all of the mentioned methods have been at the disposal of the designers, but many of the plants constructed years ago, and which are now operating under modern production pressure are burdened with cumbersome and power consuming transmission systems, because of the lack of facilities for the installation of modern methods. Power wasting transmission layouts are prevalent in many old plants because of gradual growth.

Many dollars can be saved annually by certain possible transmission alterations and replacements, because if the facts were exactly known, it would be found that the cost of maintaining poorly designed drives, together with the waste of power and the depreciation of machinery thereby incurred, constitute a heavy and now unnecessary percentage of production costs.

The transmission of power through line shafting under favorable conditions is more efficient theoretically than is generally supposed. In Prof. Goodman's text—"Mechanics Applied to Engineering," it is shown that if properly aligned, solid steel shafting, well bearinged, will transmit power a distance of 6,000 feet with an efficiency of 80% when all forces are purely torsional. This is no doubt a fact, but it cannot be applied economically in modern high pressure product on plants, because owing to the average processes requiring intermittent operations and speeds, high friction

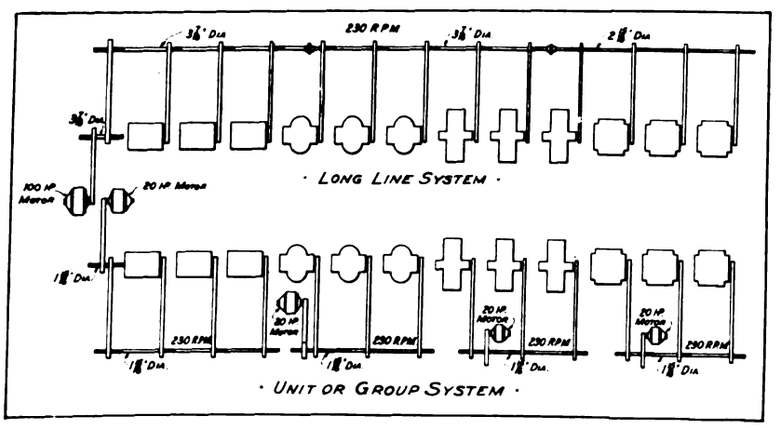


Fig. 2. This illustrates the difference between the long line, one-prime mover system and the unit or group system of drive. One requires large equipment, high maintenance, excess power, and is not flexible; the other permits lighter equipment and greatly improves the power factor.

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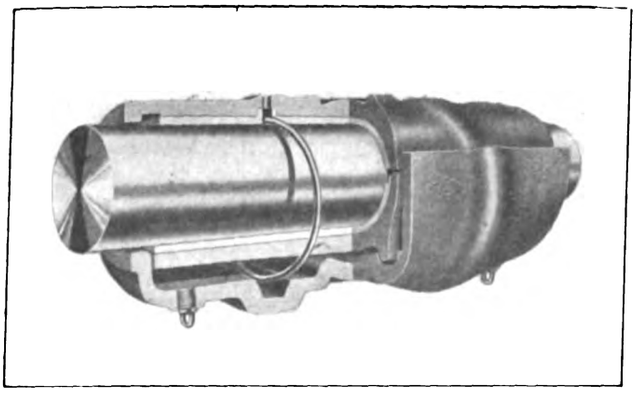


Fig. 3. Above—a modern, ring-oiling type of babbitted bearing, in very extensive use on line shafting running at moderate speeds.

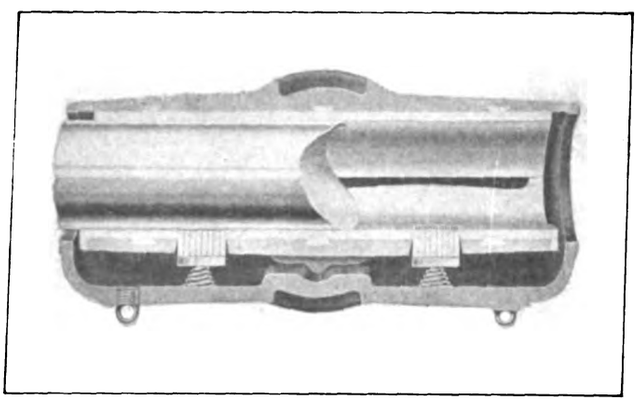


Fig. 4. At the right—a type of babbitted bearing in which capillary oiling is provided. This type precludes gritty oil being delivered to the bearing surfaces.

load and low power factor would quickly make their appearance. Modern practice and methods of economy have proven that power distribution must be split up and it also has shown that no specific rule can be laid down as to just what method to use; it must be governed by existing plant and operating conditions.

From an electrical standpoint the unit or group shafting and belting system driving a battery of machines requires less power than a direct motor connected battery of similar machines, because the starting load on each machine is higher than the running load, therefore, if individually motor equipped each machine requires a motor equivalent to its starting load. The group system can be motorized equivalent in power to a multiple of the machine running loads plus a slight margin, because each machine can be thrown in separately. It is a known fact that the efficiency of a motor is highest when it is operating at or near its rated capacity, therefore when selecting the size of motor to drive a certain group of machines, care should be exercised that machines requiring a large amount of power and infrequently operated should not be placed in group with machines requiring light or medium power. Machines of this class should be individually motor driven, otherwise the motor required for the group will be large and operated at part load when these machines of the group are not being used. Peak loads of group machine installations are to a great extent absorbed by the fly-wheel effect of the shafting and pulleys of the system.

If the four batteries of machines shown in Fig. 2 are driven by the unit or group system, it will require an aggregate of 80 horsepower split up into units of 20 horsepower, instead of 100 horsepower by the long line system, because there is practically no friction load and the units of batteries can be more accurately motorized. The lighter motors can be hung close to the shaft and possibly silent chain connected. The shaft can be 1 15/16" or 2 3/16" diameter at 230 to 240 R.P.M. with a safe fiber strain, and the cost of the equipment, such as bearings, collars, etc., will be low owing to their small size. This system is most flexible because it is possible to operate one machine or a battery of machines with no appreciable power loss.

The writer has been privileged many times to observe and study power transmission by the shafting system and one of the greatest difficulties is where shafting is supported on wooden stringers, trusses or footings. Weather conditions affect this method of supporting to such an extent that in one particular case on a line shaft 120 feet long the load varied from eighty horsepower in dry weather to 110 horsepower in wet weather, caused by misalignment brought about by the expansion and contraction of the wood and the irregularity of the bolt holes. Wherever possible, support

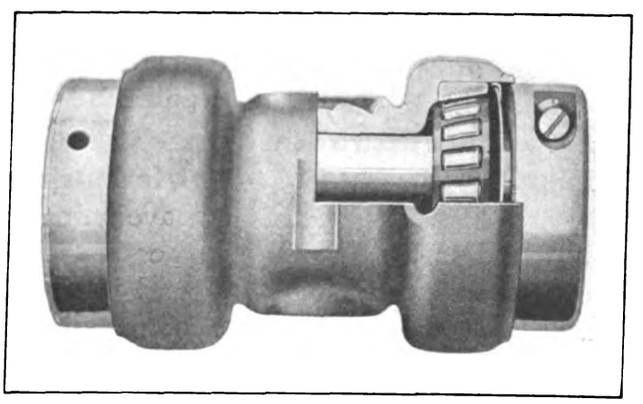


Fig. 5. At the left is shown one of the latest design solid type of power shaft roller bearing for industrial plants.

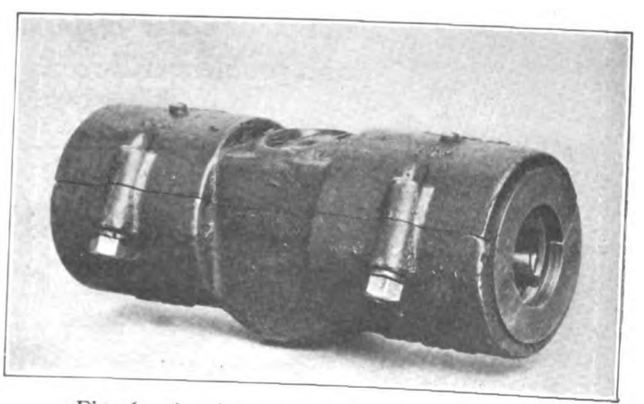
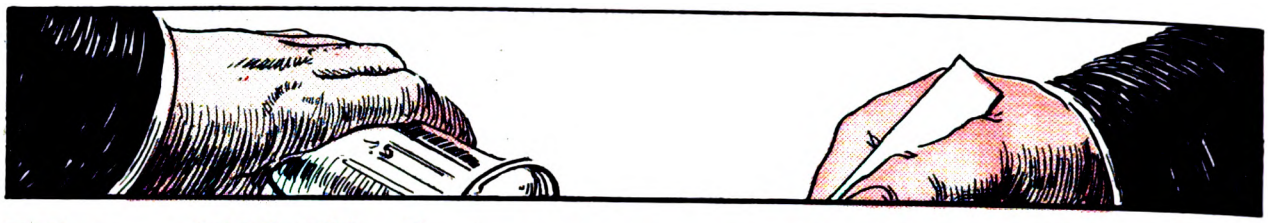
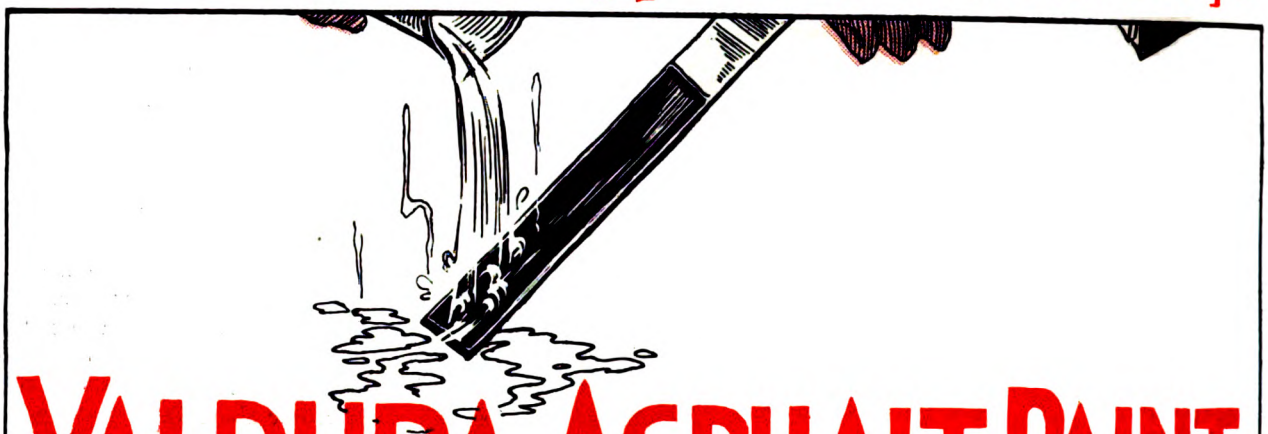


Fig. 6. Another make of roller bearing for power shafting, which has shown excellent results in power conservation.

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shafting on steel or concrete. It will eliminate excessive friction load and wear and tear on bearings, belting, etc.

Friction load in reality is bearing load and it must be considered because it is always present. High or slow speed shafting, or in fact any rotating part, must have bearings and these mediums of support on transmission lines cause friction losses, ranging from 10 to 15% in most all plants of the country.

The following table demonstrates the possible monetary losses involved due to excessive friction loads caused by the use of wrong type bearings. It is based on four pounds of coal per horsepower hour, 300 working days per year, 10 running hours per day and a coal cost of $4.00 per ton.

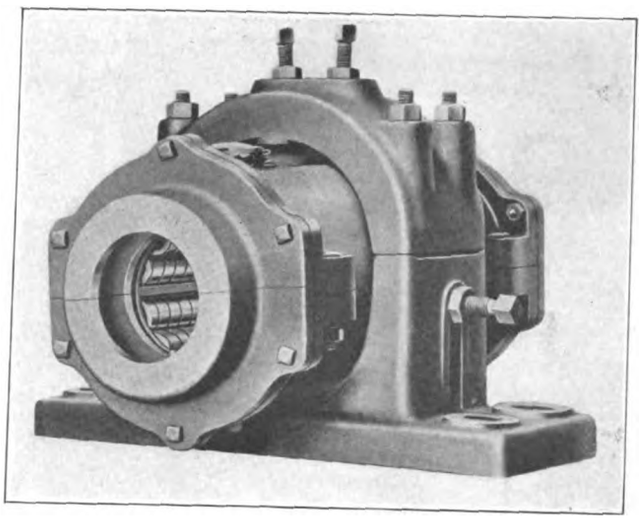


Fig. 7. The same type of bearing as Fig. 6, as mounted on an adjustable pillow block. Note that these bearings are split, for ease in application.

	Power Loss—Per Cent.				
Hp. of Plant	10%	20%	30%	40%	50%
50	$120	$240	$360	$480	$600
100	240	480	720	960	1,200
200	480	960	1,440	1,920	2,400
300	720	1,440	2,160	2,880	3,600
400	960	1,920	2,880	3,840	4,800
500	1,200	2,400	3,600	4,800	6,000
1,000	2,400	4,800	7,200	9,600	12,000

Example of Application of Table

Total bearing friction in a 300 horsepower plant was reduced from 40 to 20% by improving bearings and belting. Required, the annual saving, $2,880—1,440= $1,440.

It is evident from these figures that high bearing friction is expensive, therefore, the merits of the various types on the market should be looked into before a final selection is made. Naturally lubrication of any type is of paramount importance and an absolute necessity, because the successful operation of any bearing depends upon the maintenance of an oil film between the sliding or revolving surfaces. There are many types of adjustable and rigid babbitted bearings on the market but the real merit of one over another depends on their lubrication methods and facilities. Correct lubrication does more than reduce metallic friction. It reduces power losses by enabling the journals to move smoothly and efficiently.

That bearings have kept pace with the improvement and advancement of mechanical power transmission is evidenced by the introduction of the roller and ball type for line shaft purposes. These types have been known to save 35 to 40% friction load.

The efficiency of an open belt drive depends to a great extent upon its mechanical arrangement and center distance is one of the most important, because this feature generally governs the arc of contact on the driving pulley and the elasticity of the drive. On a drive of short center a short belt is required, which naturally results in small total elastic stretch based on a certain amount of necessary elasticity per foot for successful transmission. With a long center drive the total elastic stretch is increased, resulting in the arc of contact being increased due to the greater sag of the loose side of the belt, of course, when the tight side is on the bottom. A short center drive must overcome this lack of elasticity and decreased arc of contact by the use of a tight belt which is non-flexible and a power waster.

In many operations, however, short belt centers are necessary owing particularly to lack of space. Modern idler systems as shown in Figs. 8 and 9 have to a great extent overcome this difficulty. These systems supply the idler or tightener pulley scientifically or in such a manner as to equalize the tension and increase the arc of contact both permanently and automatically and in accordance with the load transmitted.

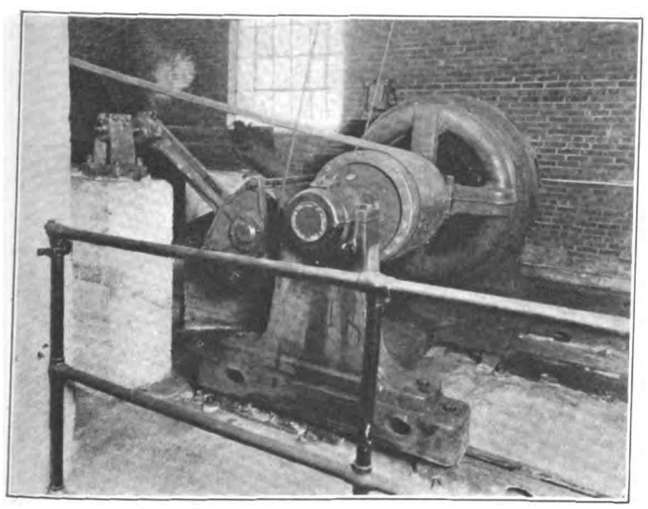


Fig. 8. A 300 hp. installation on short-center belt drive; a drive made possible through using a scientifically designed tightener system.

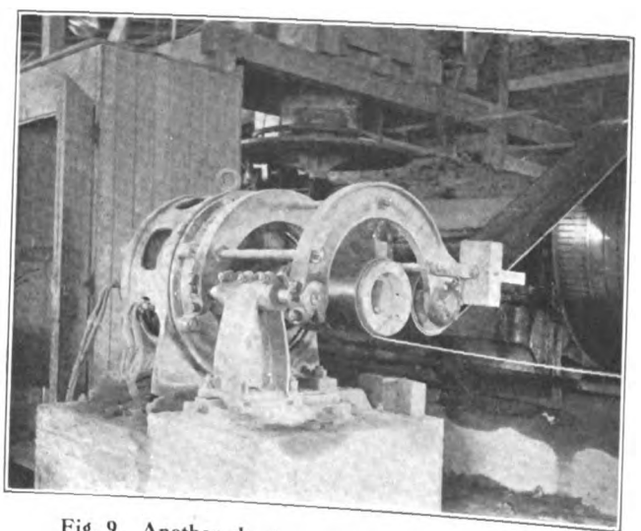
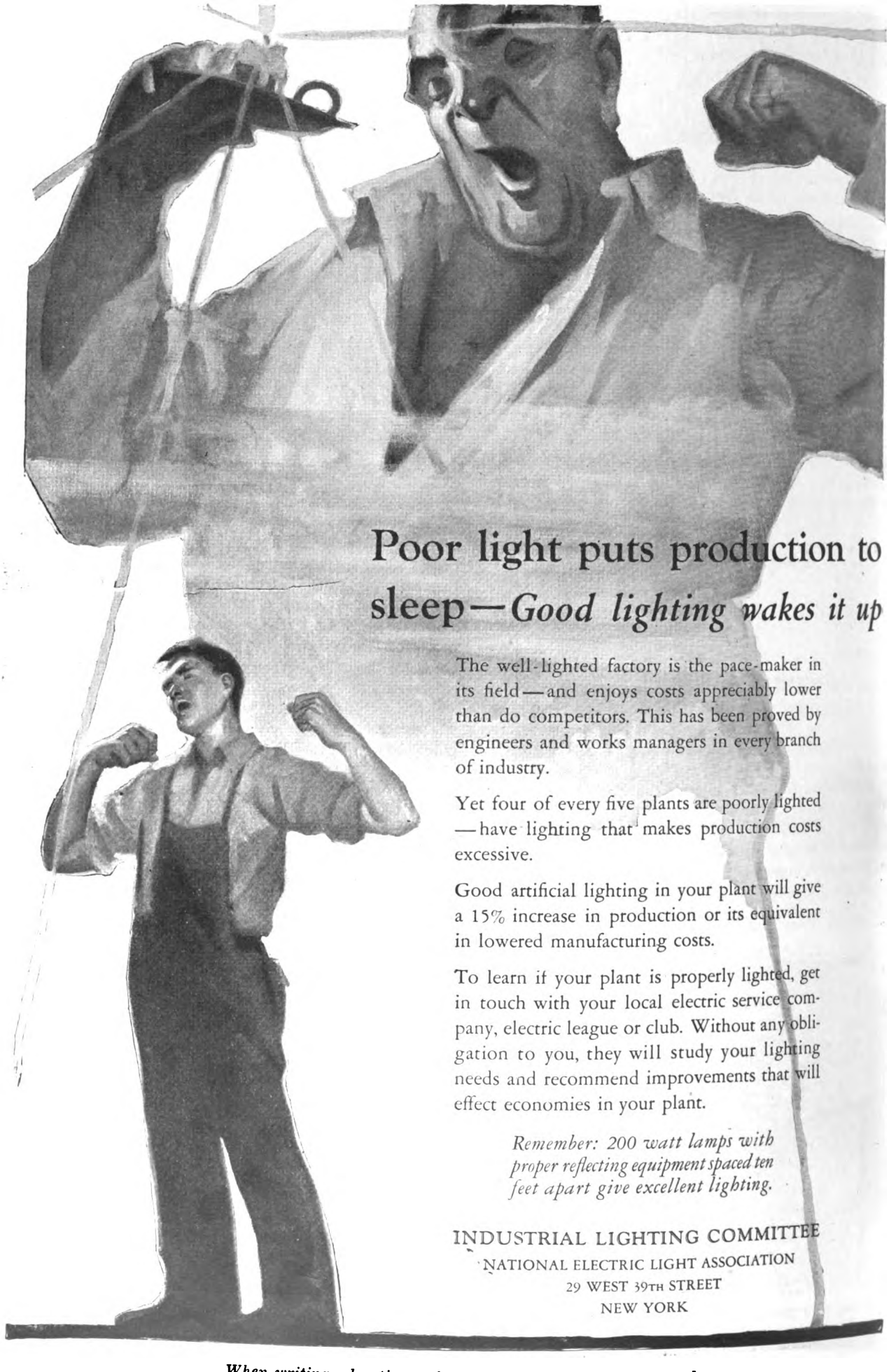


Fig. 9. Another short-center belt drive, of 100 hp., using a system similar to that shown in Fig. 8.

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The well-lighted factory is the pace-maker in its field—and enjoys costs appreciably lower than do competitors. This has been proved by engineers and works managers in every branch of industry.

Yet four of every five plants are poorly lighted—have lighting that makes production costs excessive.

Good artificial lighting in your plant will give a 15% increase in production or its equivalent in lowered manufacturing costs.

To learn if your plant is properly lighted, get in touch with your local electric service company, electric league or club. Without any obligation to you, they will study your lighting needs and recommend improvements that will effect economies in your plant.

Remember: 200 watt lamps with proper reflecting equipment spaced ten feet apart give excellent lighting.

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NATIONAL ELECTRIC LIGHT ASSOCIATION
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Showing Things Up in the Power Department

Apparatus Which Materializes the Invisible



Fig 1. Making temperatures visible is an industry in itself. Some idea of the variety of apparatus offered by one concern for this purpose is evident in this Power Show exhibit.

Courtesy The Moto Meter Co., Inc., Long Island City, N. Y.



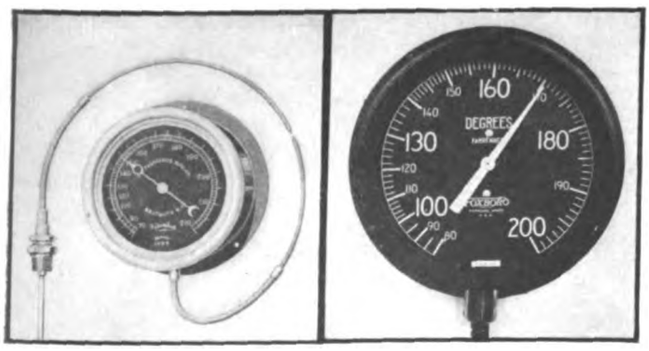
Fig. 2. A vivid streak of bright red makes this mercury thermometer easy to read. It is used for a number of industrial purposes.

Courtesy C. J. Tagliabue Mfg. Co., Brooklyn, N. Y.



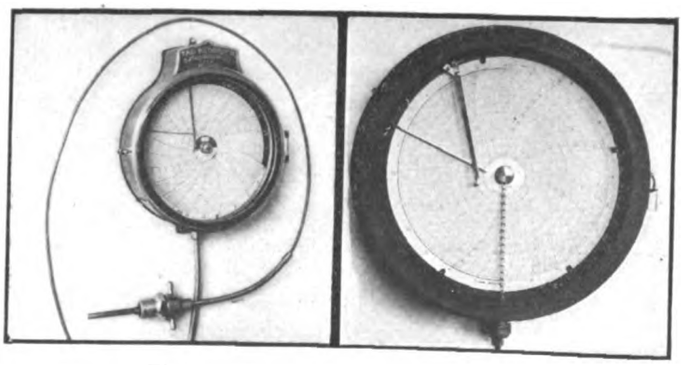
Fig. 3. This combined thermometer and vacuum recorder automatically compensates for barometric changes in recording the vacuum. It is particularly adapted to use with steam turbines whose efficiency depends upon the true vacuum carried.

Courtesy Uehling Instrument Co., Paterson, N. J.



Figs. 4 and 4a. Dial indicating thermometers are easily read at a considerable distance. Electrical signals can be made to indicate maximum or minimum temperatures if required.

Courtesy C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., and The Foxboro Co., Inc., Foxboro, Mass.



Figs. 5 and 5a. Temperature recorders go one step further than temperature indicating instruments in that they make a 24-hour record of all fluctuations.

Courtesy C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., and The Foxboro Co., Inc., Foxboro, Mass.

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A Cost Accountant Shows How

A certain manufacturer investigated possibilities of the electric truck in his plant—he now shows a net saving of 66⅔% of former costs of handling materials. Demurrage charges on freight cars, a costly item, are entirely eliminated.

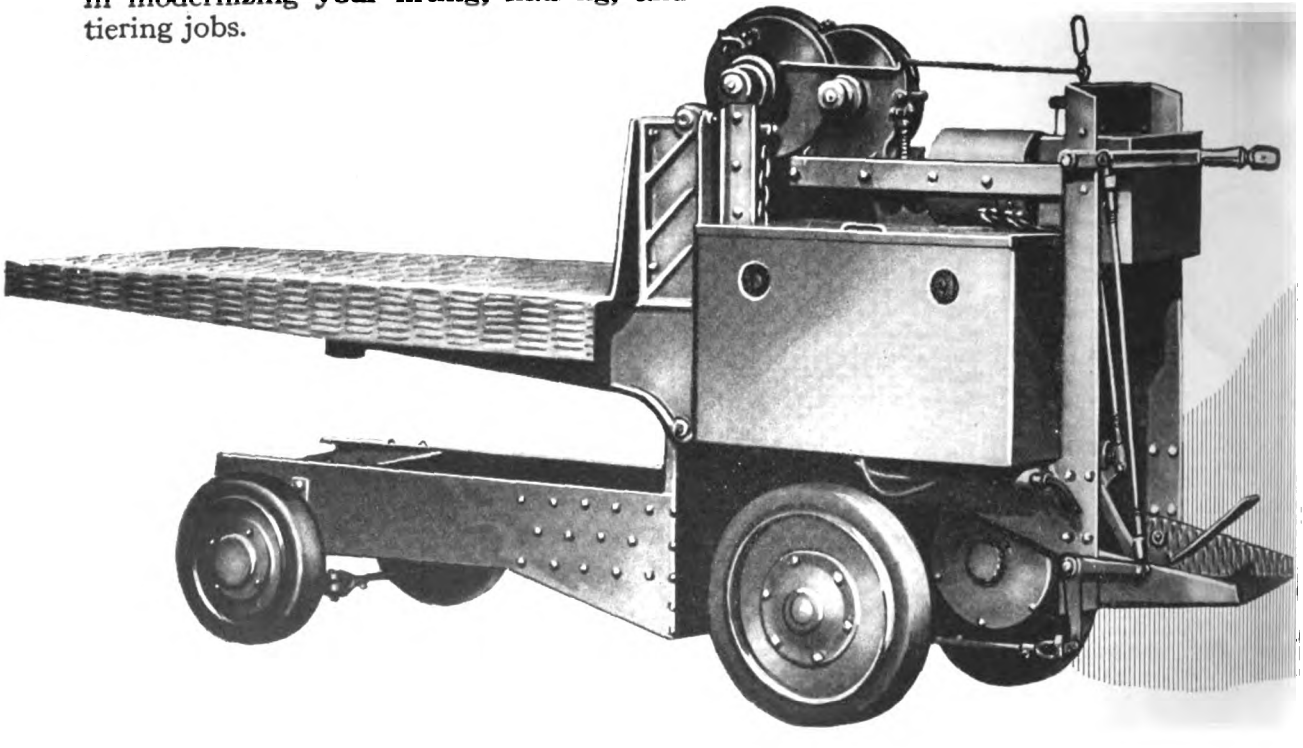
In the warehouse of another company the cost of handling 2000 lb. hogsheads was cut 60% by an electric. A 50% saving in handling costs, and a 70% increase in storage capacity resulted from an electric lift truck installation in a stock room.

Coal handling costs were cut 60% at a Rhode Island textile mill by an industrial truck with side dump body, carrying one-ton loads from storage pile to boiler room.

These are typical of hundreds of authentic and remarkable records, which prove the essential need of electrics in industrial material handling. Industrial truck and tractor manufacturers will gladly serve you in modernizing your lifting, hauling, and tiering jobs.

	Hand Labor	Elec. Truck
Bales— 300 lbs.	$0.12	$0.08
Mdse. Bag 175 lb.	0.09	0.04
Mdse. 250 lb. Bundles	0.48	0.13
Liquid— 1000 lb. Drums	0.40	0.10

Let your men man electrics—more work, in less time, at lower cost.

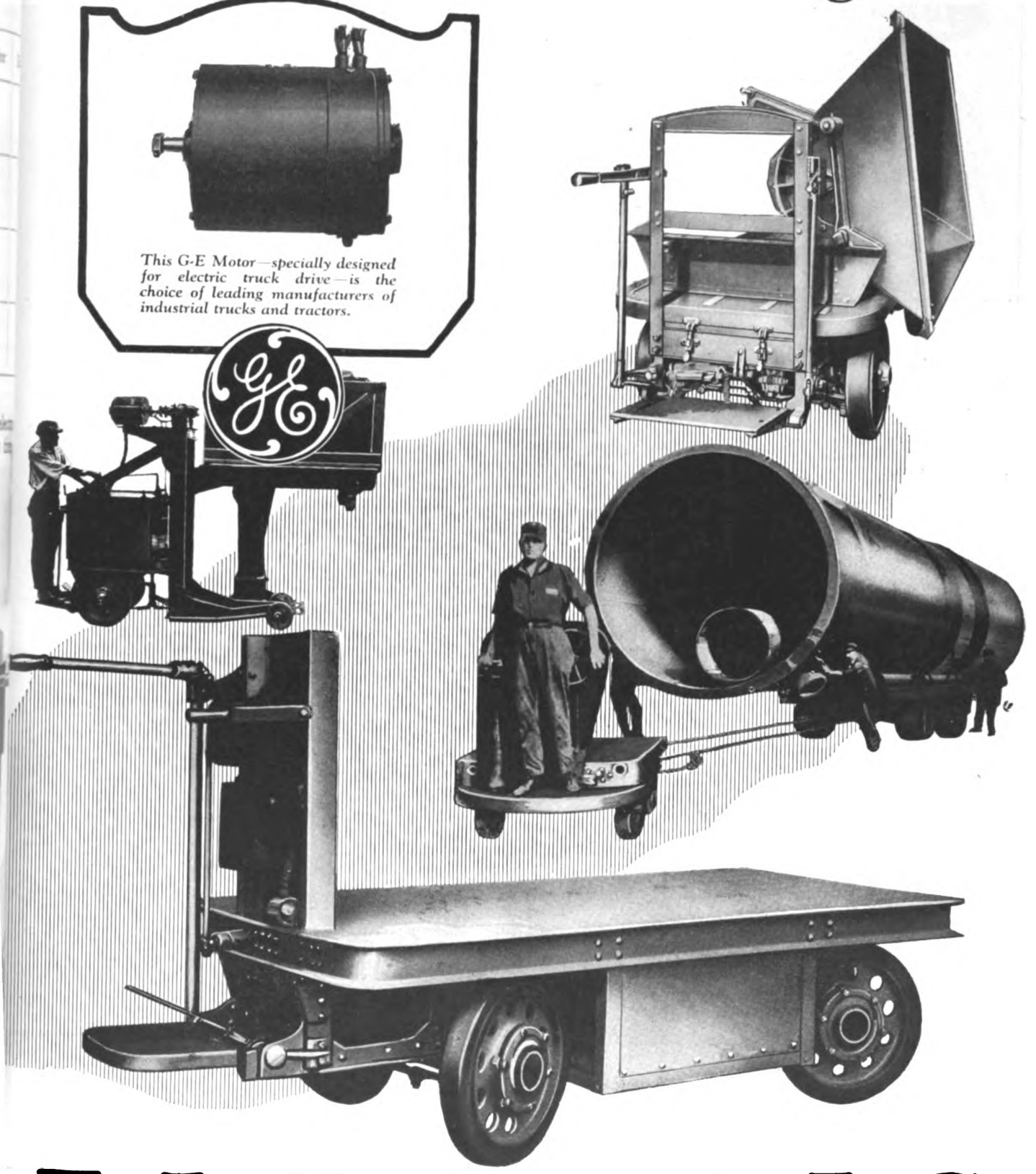


GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

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Electric Trucks Cut Handling Costs

This G-E Motor—specially designed for electric truck drive—is the choice of leading manufacturers of industrial trucks and tractors.



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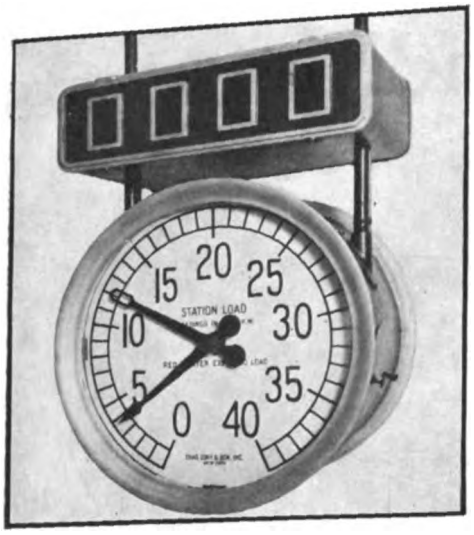


Fig. 6. This load indicator is equipped with a black present load and red expected load pointer. A period light indicator designates the time interval to expected load indicated. The expected load pointer is manually actuated from a bench board or panel.

Courtesy Chas. Cory & Son, Inc., New York



Fig. 7. Operating orders are conveniently and unmistakably transmitted to and from distant locations by means of the equipment here shown.

Courtesy Chas. Cory & Son, Inc., New York.

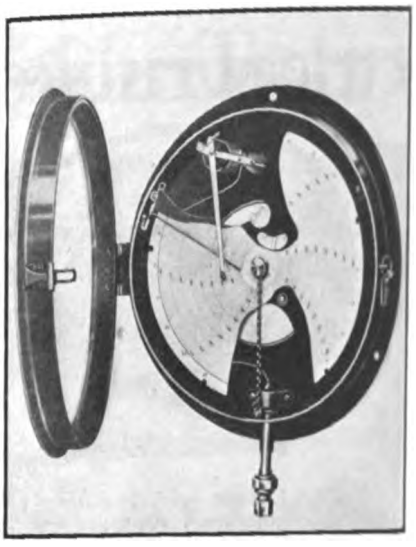
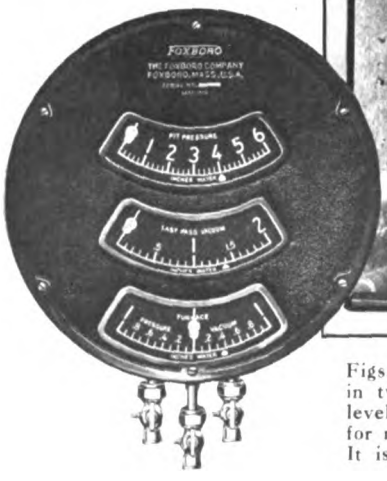


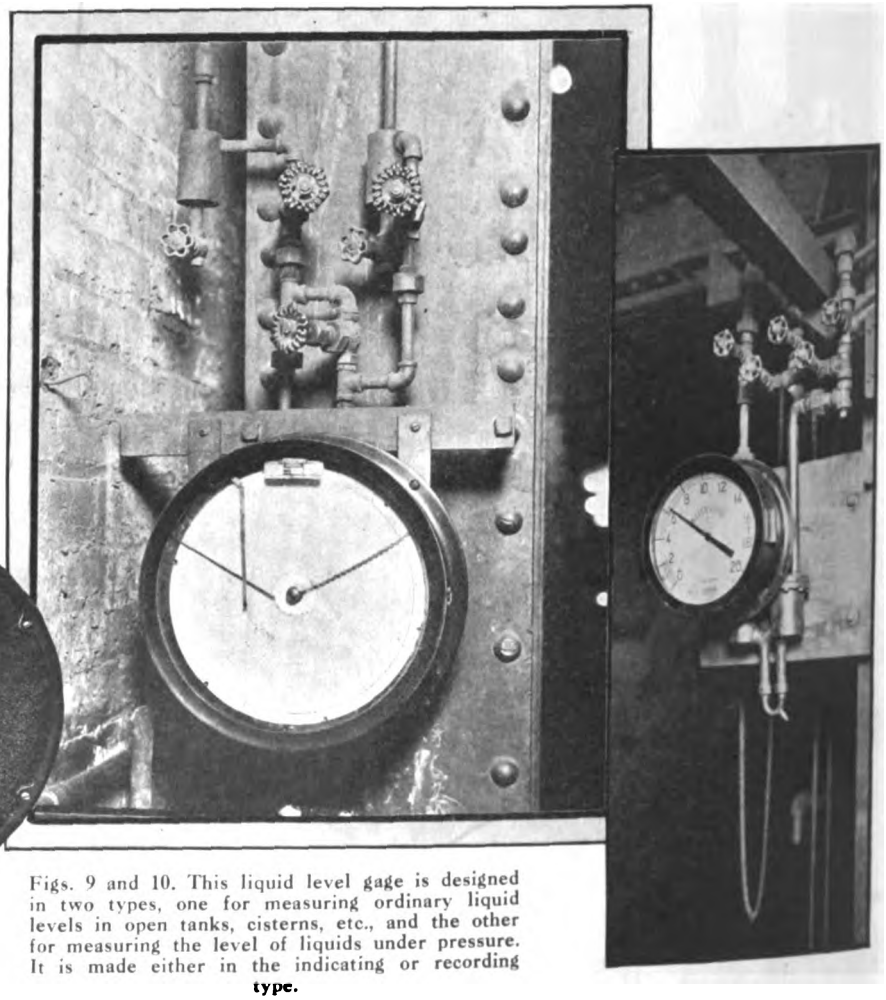
Fig. 8. Recording pressure gage on a boiler gives the engineer an accurate record of the fluctuations in pressure which with draft, water and steam flow performance data tell the story of operation.

Courtesy The Foxboro Co., Inc., Foxboro, Mass.

Fig. 11. This draft gage is easy to read at a distance. It is made in the recording as well as the non-recording type and gives a fine check upon combustion and is a guide to fuel economy.

Courtesy The Foxboro Co., Foxboro, Mass.





Figs. 9 and 10. This liquid level gage is designed in two types, one for measuring ordinary liquid levels in open tanks, cisterns, etc., and the other for measuring the level of liquids under pressure. It is made either in the indicating or recording type.

Courtesy The Foxboro Co., Inc., Foxboro, Mass.

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Fighting Friction in Power Transmission

Proper Lubrication the Key to Efficiency

By Allen F. Brewer

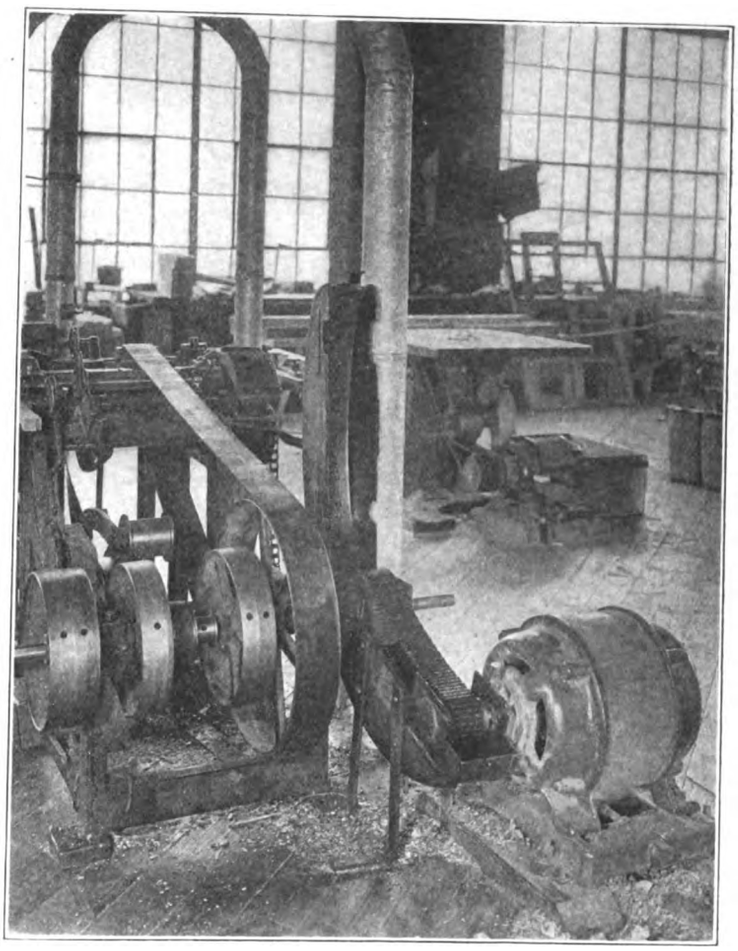
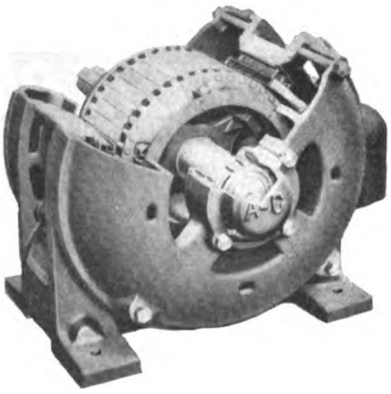


Fig. 1. Wherever there may be metallic particles involved, as in the machine shop, for example, the most careful attention should be given to any power transmitting equipment, such as line shaft bearings, pulleys, or chain drives. Wherever possible such wearing elements should be enclosed or properly guarded.

Fig. 2. In the attainment of more efficient transmission of power one of the most interesting improvements has been the application of anti-friction bearings to the electric motor. The illustration below brings out plainly the installation of roller bearings. It is interesting to note how compact the entire bearing is and to mention that in such an installation the possibility of lubricant finding its way into the windings of the motor to perhaps cause burn-outs is materially reduced.



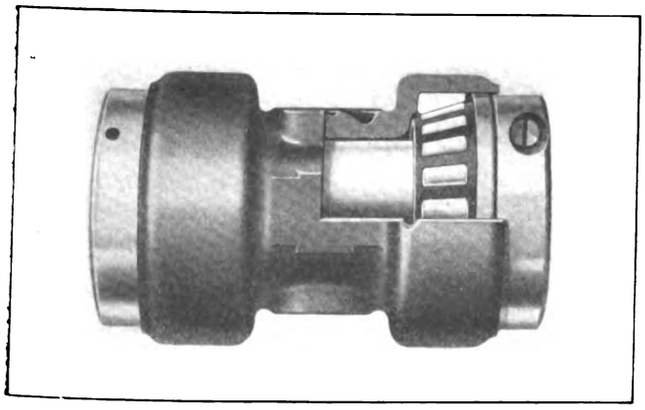


Fig. 3. The application of the roller bearing to line shaft hanger bearings is an extremely practicable idea. The above view brings out clearly the compactness of such an installation, the arrangement of the rollers and the relation of the shaft to the roller raceways and housing.

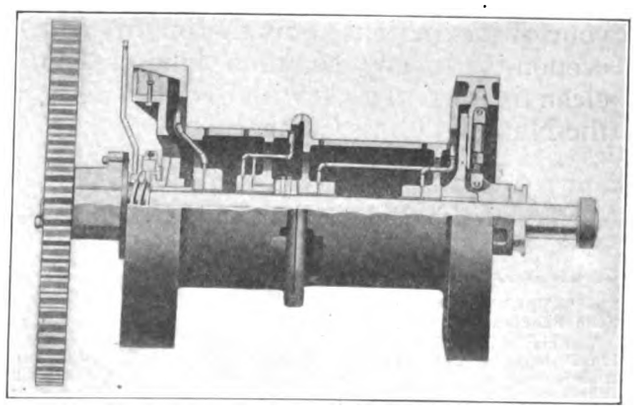


Fig. 4. Cutaway view of an independent automatic drum, as installed on a locomotive crane. The transmission of power from the prime movers on such a machine requires the most careful attention to lubrication of all wearing parts. This particular type of drum is equipped with self closing oilers, which can never be concealed by the rope.

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effects. The reduction in the amount of light transmitted through a window, due to unclean conditions, is a large percentage of the total. Actual tests have proved that at least 50% of the total light available may be wasted because of accumulations of dirt on glass. I believe that the windows in every industrial plant should be washed at least twice a year, and, in some industries, such as foundries and machine-shops, at least once a month, depending upon operating conditions. This is especially true in the winter season. Some large plants maintain a department with the sole duty of cleaning skylights and windows. This is a paying proposition, since not only does regular cleaning assist in reducing the lighting bills, but it helps keep the building in first-class condition.

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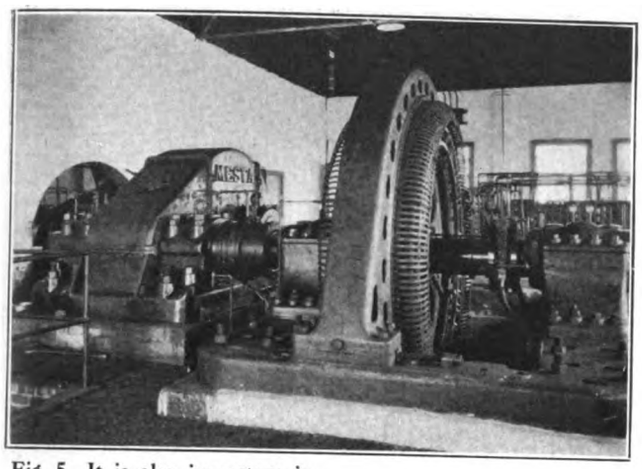


Fig. 5. It is also important in the attainment of maximum power transmission that couplings, wherever necessary, be as effective as possible. The above illustration brings out the location of a flexible coupling, which effectively insures against any abnormal loss of power. This coupling, however, must be properly lubricated, otherwise in itself it may involve friction losses, which may become of material importance from a power transmission point of view.

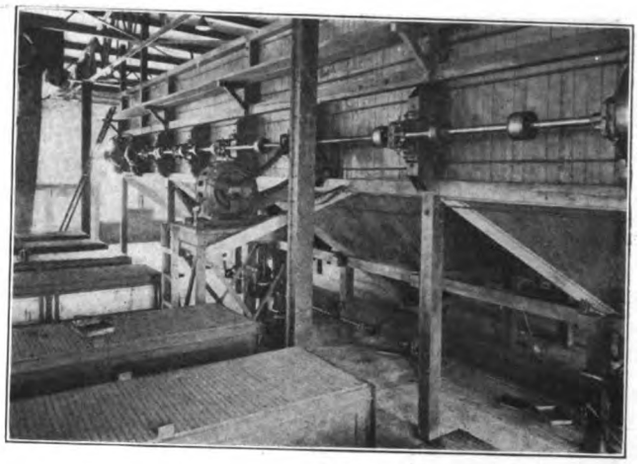


Fig. 6 A line shaft installation in a seed and fertilizer plant. This particular illustration shows the grinding room. It can easily be appreciated that there may be a possibility of dust or dirt in the air in such a room. Therefore, the utmost care must be taken to protect all power transmission equipment such as line shafting bearings, driving chains, pulley bearings, and, in fact, all other wearing parts, otherwise the entry of dust or abrasive matter might seriously impair the attainment of the right kind of lubrication.

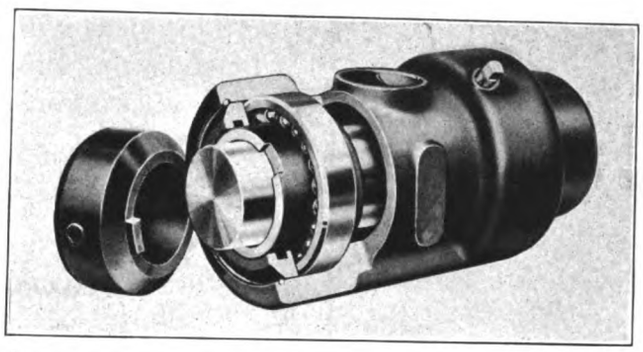


Fig. 7. In contrast with the illustrations of roller bearings as shown elsewhere in this article, it will be of interest to note the accompanying view, above, of a ball bearing, line shaft hanger installation. This is likewise an extremely compact device designed to operate with a minimum requirement of lubricant and the least amount of friction.

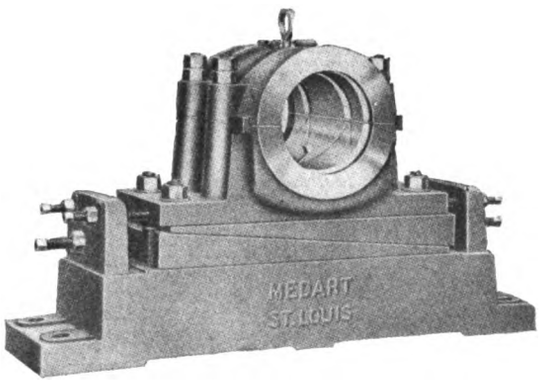


Fig. 8. Plain bearings are also quite adaptable to shafting and other power transmission equipment, if properly designed as shown at the left. Note, in this instance the adjusting bolts and wedges which are extremely valuable when necessary to realign the bearing with the least amount of trouble or expense. Perfect alignment is of course, one of the essentials of efficient power transmission. Proper oil grooving is another factor which must be given careful attention in a plain bearing.

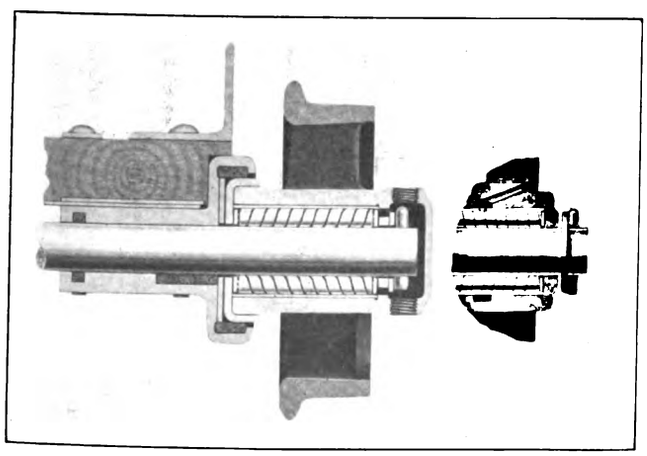


Fig. 9. Mine car wheel bearings also require careful attention to lubrication and the installation of properly designed lubricating systems if frictional losses are to be kept down. The operating conditions are frequently so severe, and dust, dirt and water so prevalent that it is relatively difficult to attain this end. Roller bearings have proven adaptable to such service, not only insuring lubrication and protection of the journals, but also reducing the amount and frequency of attention necessary.

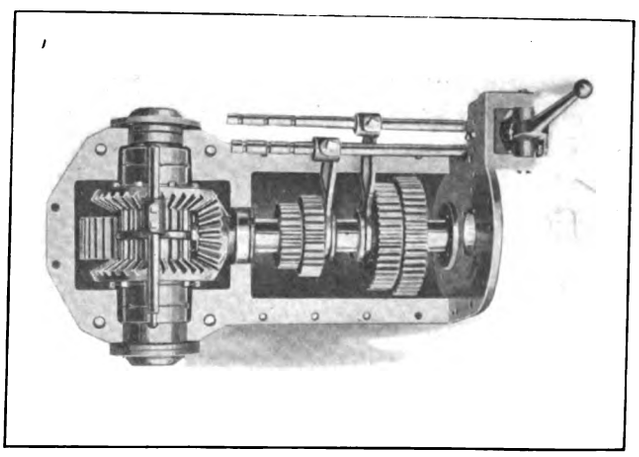
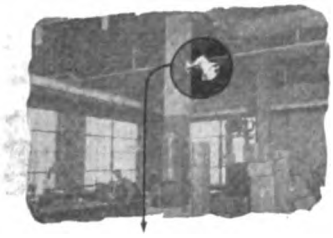


Fig. 10. It is also important that transmission gearing be properly lubricated if the power is to be economically transmitted to the operating element. This illustration brings out clearly the gearing as employed on an industrial type of gas engine locomotive.

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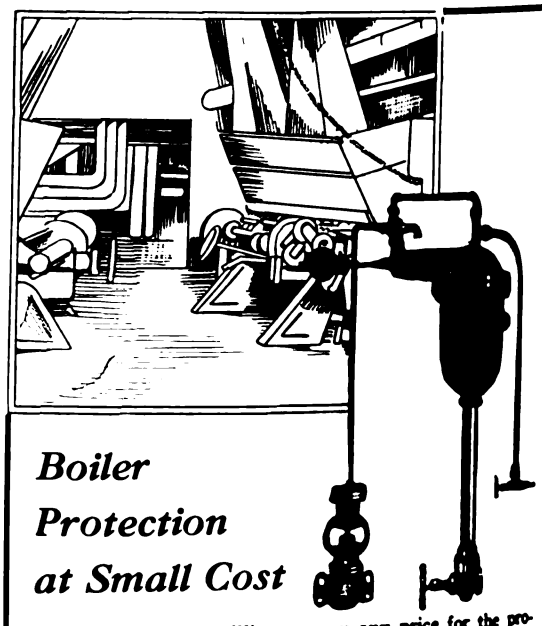
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Fig. 11. In the automatic handling of ice, we can appreciate that lubrication of the handling equipment may often be a difficult problem, due to the low temperatures involved. It is, therefore, absolutely urgent where machinery is to be used under abnormally low temperatures that the oil employed have as low a cold test as possible. Otherwise considerable power may be lost in its application.

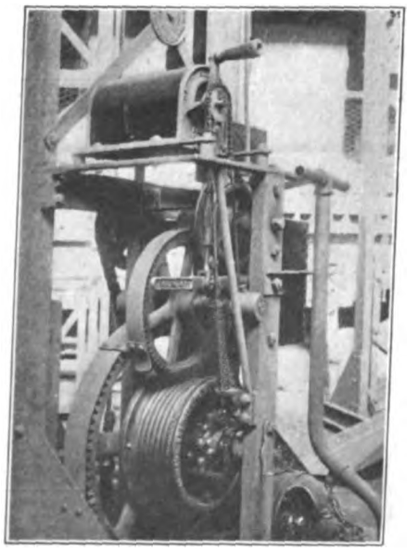


Fig. 12. General details of an electrically operated materials handling machine. Such apparatus is often exposed to extensively varied conditions throughout a plant. For this reason, attention must be given to the choice of oils and other compounds. The use of ball bearings on such equipment is a forward looking step.

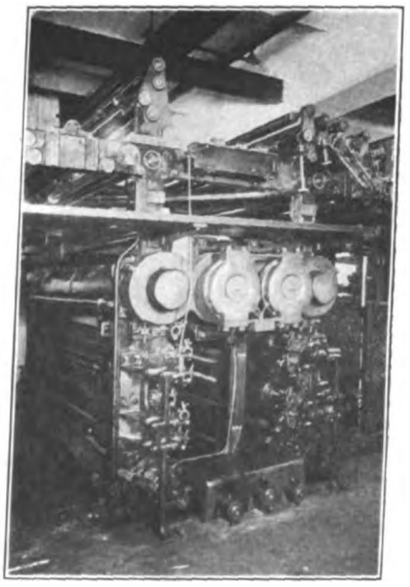


Fig. 13. In the transmission of power to machinery such as the news press, it is important that all bearings be effectively lubricated. To maintain this almost human device in the best possible condition and to insure that the least amount of power will be required for its operation, the force feed, mechanical lubricator, as shown, has been found to be particularly adaptable.

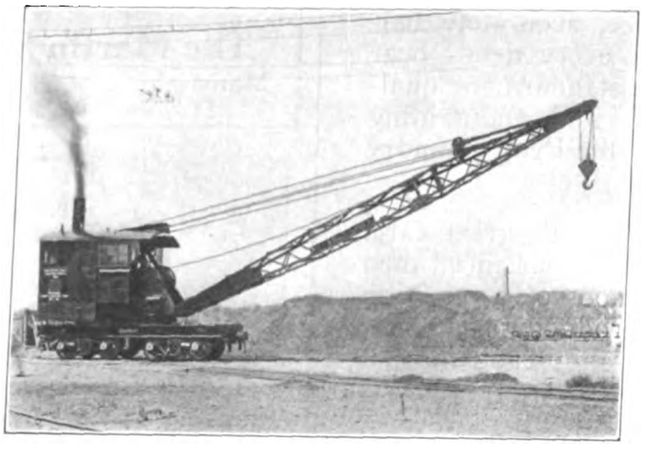


Fig. 14. In the transmission of power from the engine to the working elements of a locomotive crane a number of factors exist, all of which may cause problems due to faulty lubrication. All of the parts are more or less exposed to the weather and certain of them are located in inaccessible places. Therefore, their lubrication requires most careful attention.

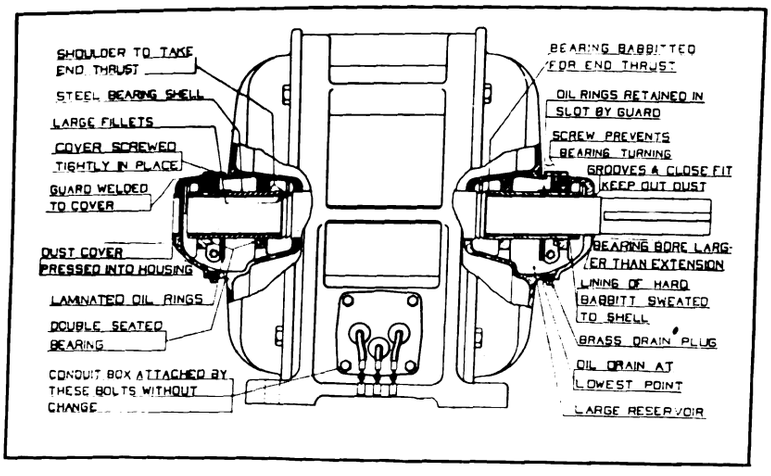


Fig. 15. Sectional view of bearings and housings on an induction motor. Note in particular the double seated bearings, the oil drains, the dust covers pressed into the housings, the capacity of the oil reservoir and the laminated oil rings. A ring oiling system of this type is an extremely efficient lubricating device and insures the transmission of the greatest amount of power with a minimum of friction.

POWER is relatively useless without the medium of transmission, for power is an agent whereby work is accomplished. Therefore, power transmission equipment must interest us quite as much as power generating apparatus, and wastes, here, are just as costly.

Friction, dependent upon its intensity, or the extent to which it is allowed to continue uncontrolled, can very easily make or break a plant. We have but to visualize a turbine casualty due to burned out bearings, a line shaft down, or a step bearing out of commission to realize how such occurrences might so materially affect production that the monetary losses would be irrecoverable.

So we must make every effort to control and reduce friction. Only can this be attained by attention to lubrication, the installation of equipment for the most economical usage of lubricants, and the selection

(*Continued on page* 51)

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PYOTT
Transmission Equipment



PYOTT *Redface Pulleys*

Pyott Red Face Pulleys are perfect, symmetrical in appearance, accurately balanced, strong, and in every detail bear out a long established standard for quality. Every facility for maintaining quality is employed by the Pyott Foundry Company.

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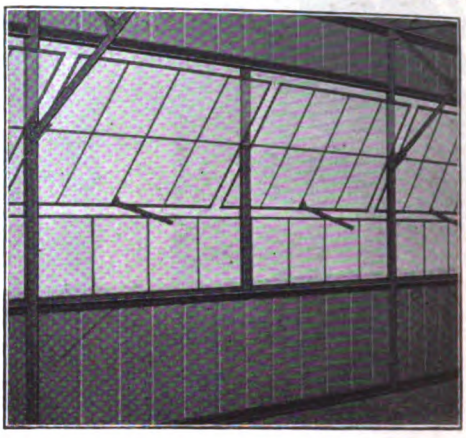
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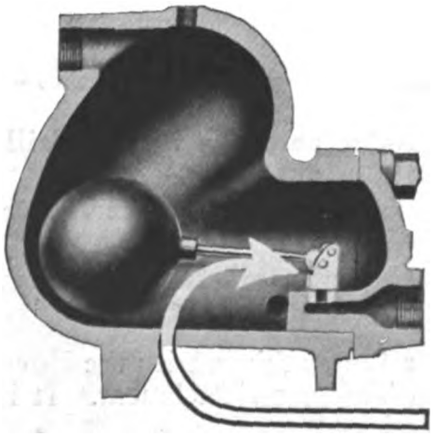
The Soles are of light weight, close grain selected maple. Fastened to uppers with wire by our own patented process. Men like them because they are comfortable—easy to put on and take off and keep the feet in healthy shape. They are far better for the feet—last longer and much more economical than rubber boots.

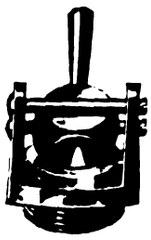
Davenport Wood Sole Shoes are made in various qualities and in all sizes. Boots may be had if desired. Write for Booklet and Price List or order samples on approval.

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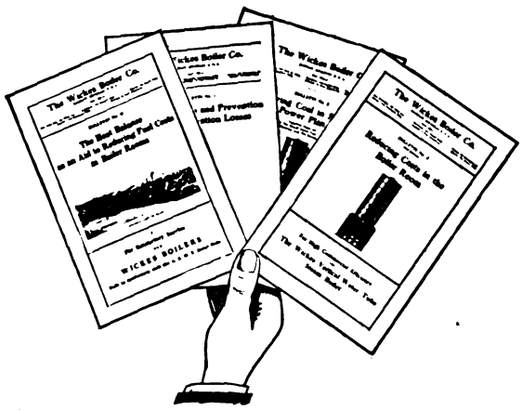


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Fighting Friction in Power Transmission

(*Continued from page 47*)

of oils and greases of characteristics to conform with the operating conditions involved. Thereby can we increase the unit value of our power at the point of application, for just as friction is reduced power losses will be decreased as a rule.

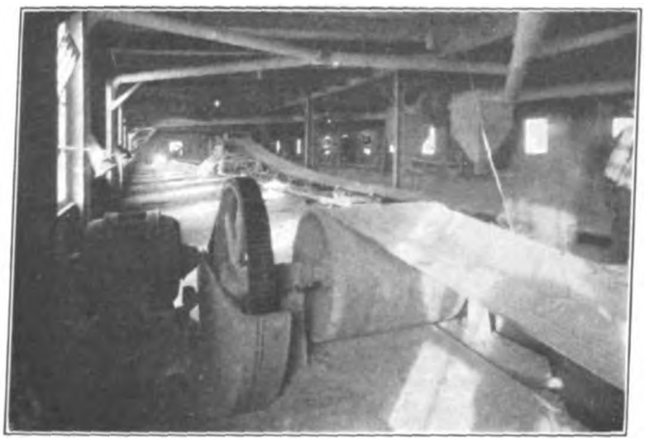


Fig. 16. In the operation of elevator and belt conveyors a great deal of power is oftentimes lost due to abnormal friction, the presence of dust and dirt, or perhaps, temperature differences. In the above illustration steps have been taken to reduce power transmission losses as far as possible by installing a silent chain from the electric motor to the belt pulley.

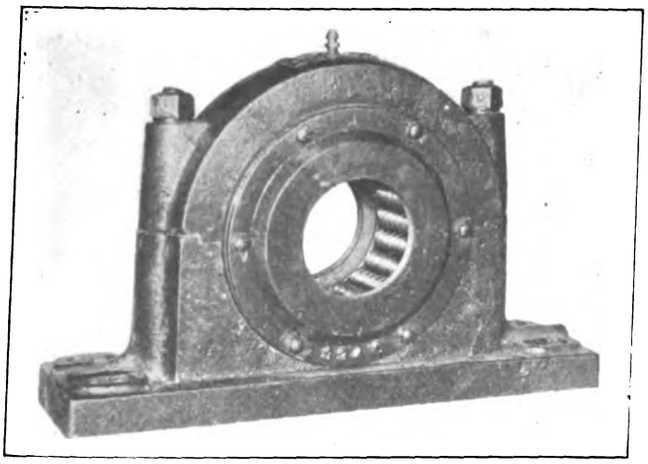


Fig. 17. A roller bearing pillow block showing the arrangement of helical roller bearings within. Compactness, ability to retain the lubricant, and economy of operation are features which lead to very efficient transmission of power. In certain industries such as the textile, for example, oil tight bearings are most essential, if maximum protection of the fabrics or stock is to be insured.

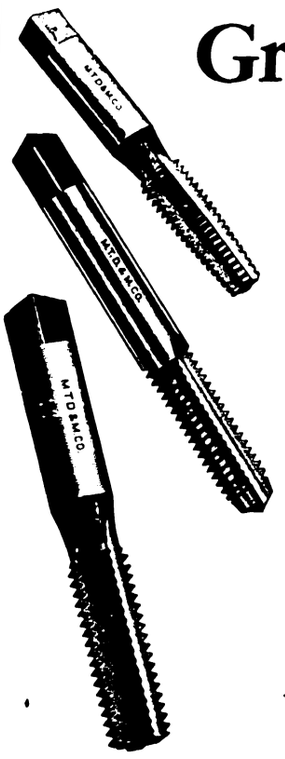
Omission

CREDIT should have been given to the New Britain Machine Co., of New Britain, Conn., in connection with the article which appeared on pages 12, 13 and 14 in October INDUSTRY ILLUSTRATED, entitled "Setting the Table for Industry." A large number of the photographs included in that article were secured by our editors at the plant of the above company, as well as considerable of the information contained in the text.

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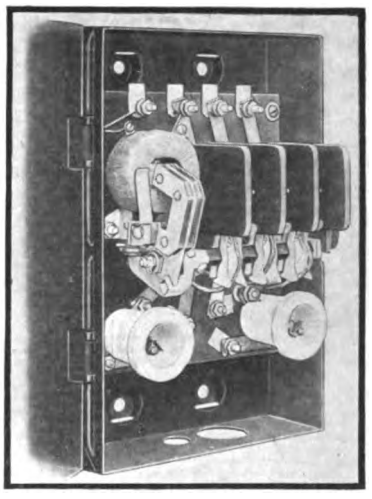
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A Page of New Electrical Appliances







Figs 1, 2 and 3. These illustrations show exterior and interior views of the new Cutler-Hammer "across-the-line" starter together with the push button master station which actuates it. This is an interesting and useful development in remote control for electric motors.

Courtesy The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

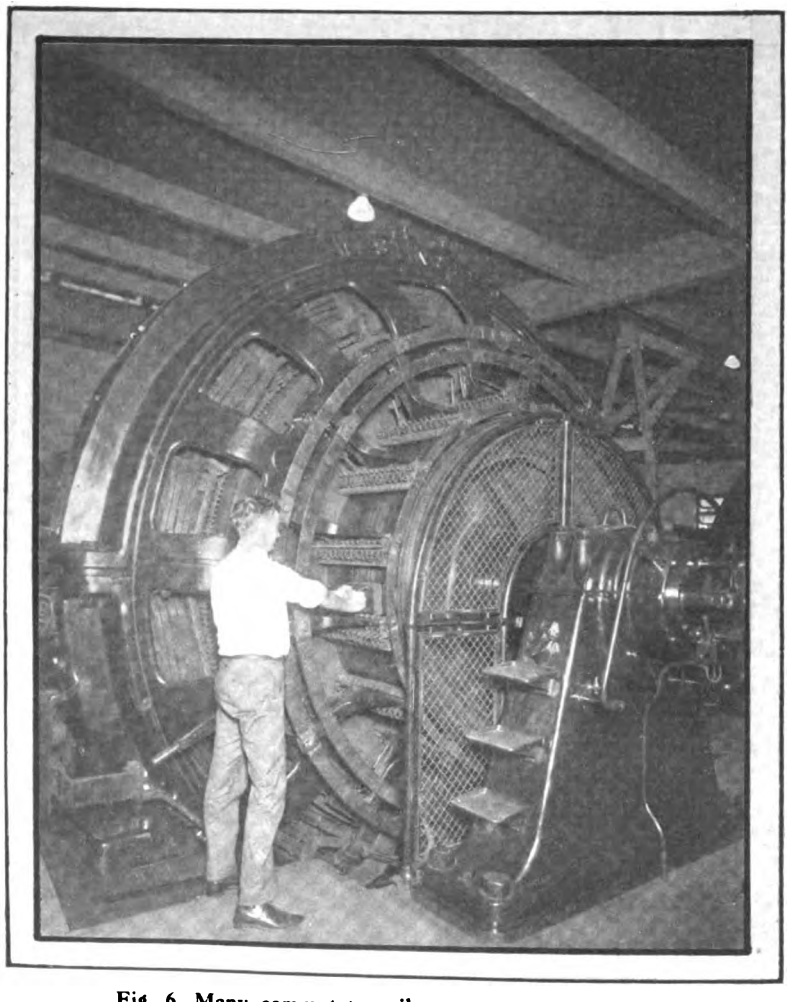
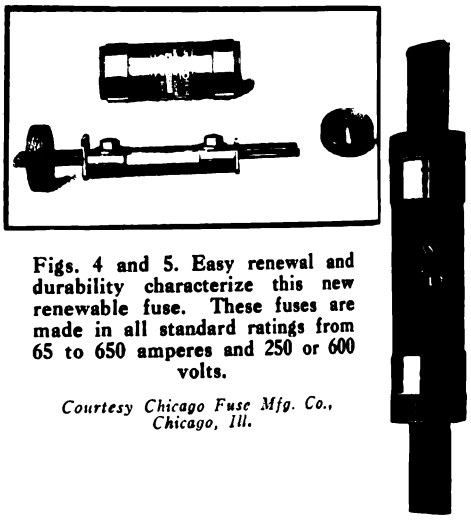


Fig. 6. Many commutator ailments can be cured by the use of a commutator resurfacer. This Ideal surfacer is said to be absolutely non copper collecting as well as non conducting.

Courtesy Ideal Commutator Dresser Co., Sycamore, Ill.



Figs. 4 and 5. Easy renewal and durability characterize this new renewable fuse. These fuses are made in all standard ratings from 65 to 650 amperes and 250 or 600 volts.

Courtesy Chicago Fuse Mfg. Co., Chicago, Ill.

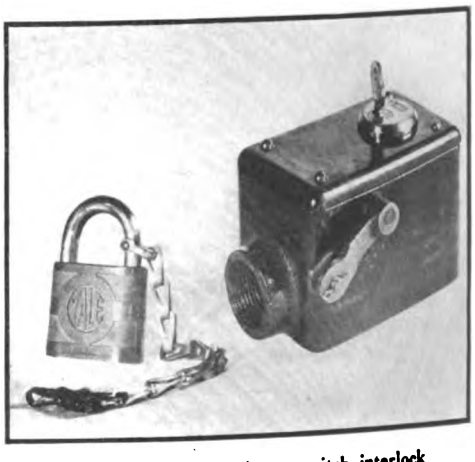


Fig. 7. The Robinson switch interlock protects workmen from entering bus cells under load until the circuit breaker is open.

Courtesy Chas. Cory & Son, Inc., New York.

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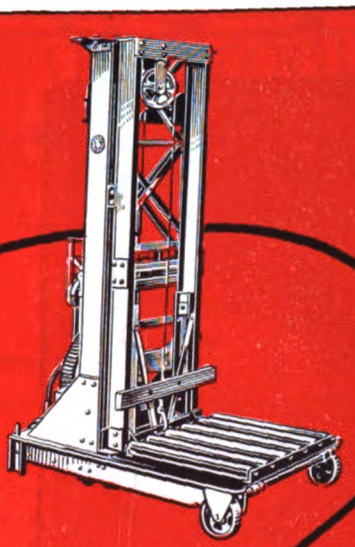
It tells a story better than Webster's whole dictionary—it doesn't cost you a nickel but its worth many dollars—for it shows how to save money.

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A factory executive recently asked us about the "moral effect" of Calculagraph. We would like to make it clear that in the thousands of factories where Calculagraph has been operating for many years we have proved over and over that Calculagraph is *not* resented by the workingmen—does *not* rouse animosity—is *not* a policeman!

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Positive Lubrication of Production Machinery Saves Power

Don't Depend on the Haphazard Oil Can

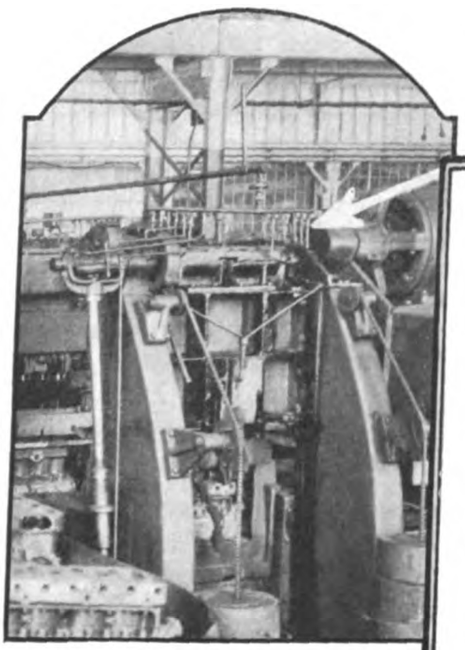


Fig. 1. Henry Ford believes in thorough lubrication of machine tools not only because it saves power but because it prevents breakdowns and reduces depreciation.

USE power intelligently. This means avoid its waste. One of the chief sources of power waste lies in improper lubrication of driven machinery. How can one expect the haphazard squirting of a few drops of oil into open bearings to provide proper lubrication?

There are various types of lubricating systems, among them the gravity feed, positive pressure feed and the "push the pedal" or one shot system similar to motor car practice. Modern practice calls for positive lubrication of industrial machinery.

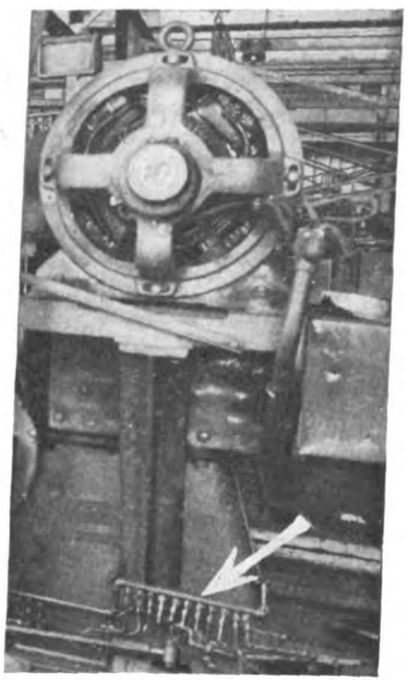
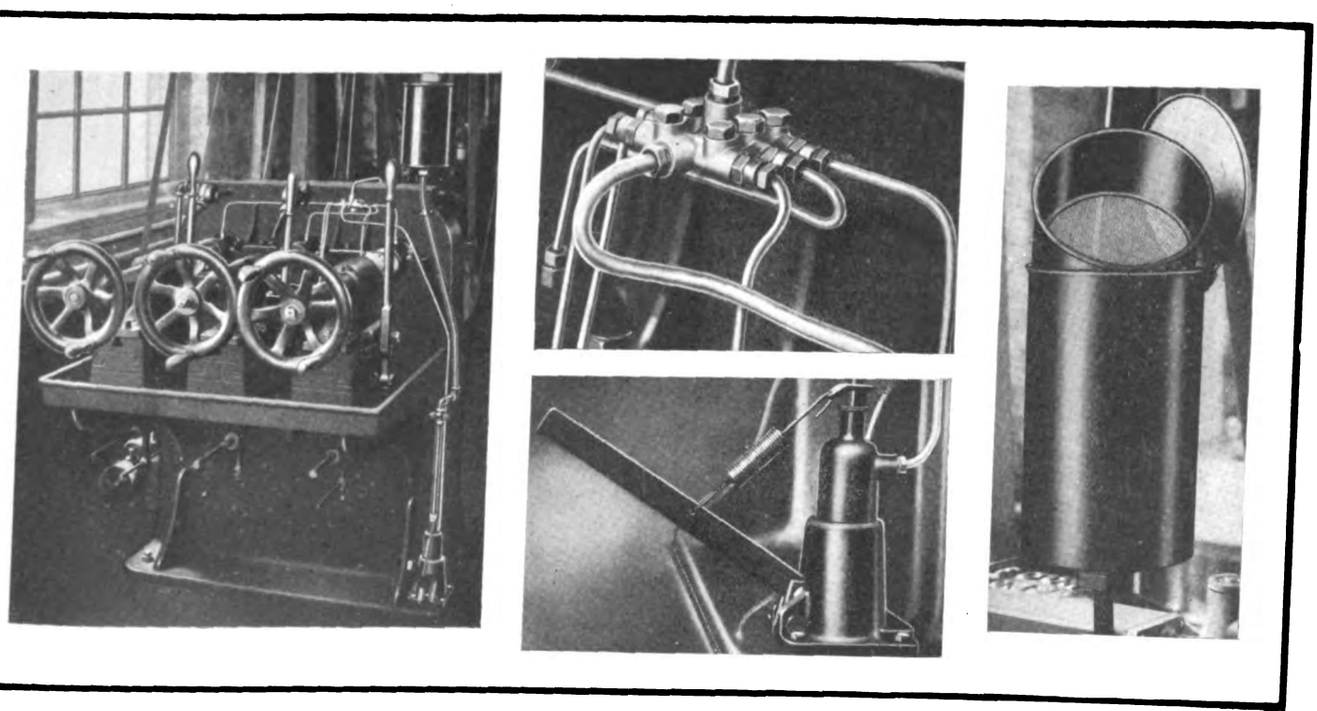


Fig. 2. Every bearing of this tool receives oil under pressure from a central pumping service.



Figs. 3, 4, 5 and 6 (group) "Push the pedal" has become a popular and easy way to lubricate all of the important bearings of a motor car. This same idea has been applied to industrial machinery as shown in these illustrations. The system is shown applied to a bolt threading machine and the principal parts of this system are shown enlarged.

Courtesy of Bowen Products Corp., Auburn, N. Y.

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—For handling coal, coke, or ashes with a clamshell bucket.
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McMyler-Interstate locomotive cranes are built in sizes of from 10-tons to 50-ton

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Fig. 293
Flanged, Extra Heavy Iron Body Automatic Equalizing Stop and Check (Non-return) Angle Valve.

Should a tube burst, or other internal rupture occur, these valves automatically shut off the flow of steam from the header to the affected boiler.

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Jenkins Valves
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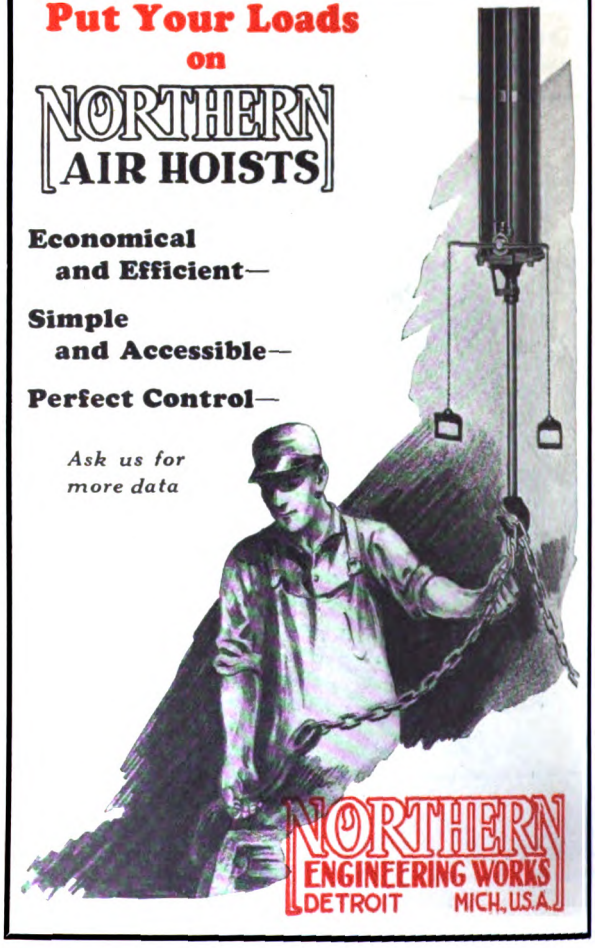
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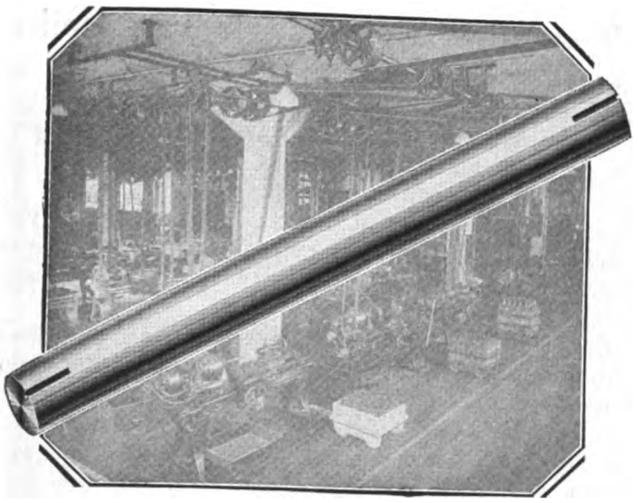
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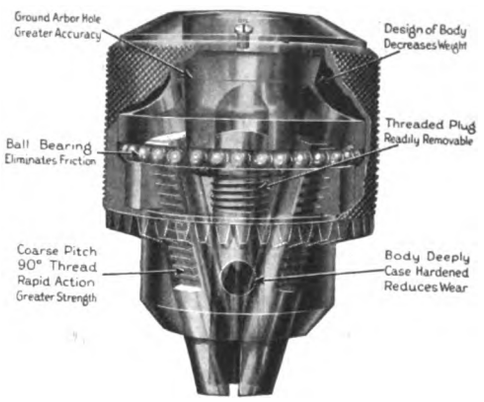
Buy by the Medart Catalog and Discount Sheet

Buy right—with Medart Catalog No. 43 and discount sheet. A complete, simply written, readily understood manual containing dimensions, details and list prices for the use of engineers, designers and power users. Covers the entire range of power-transmission equipment. Send for your personal copy and include requests for other members of your staff who would find this information valuable.

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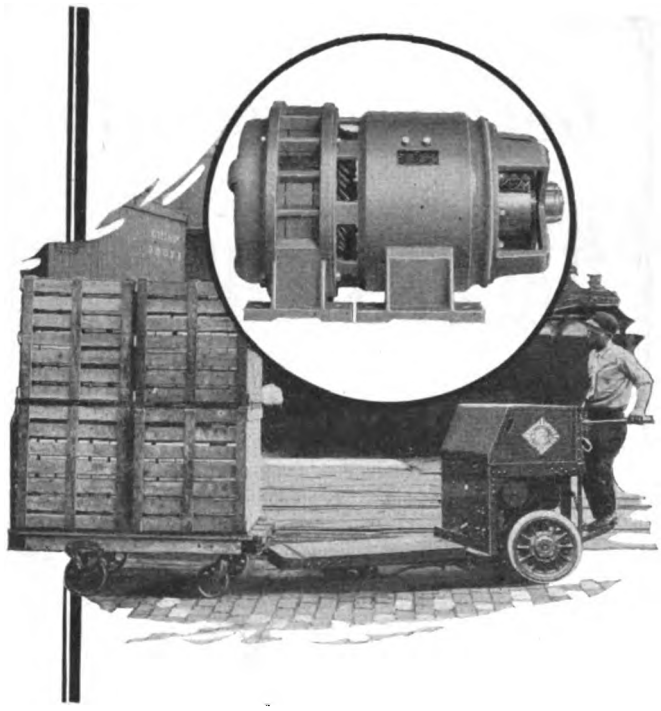
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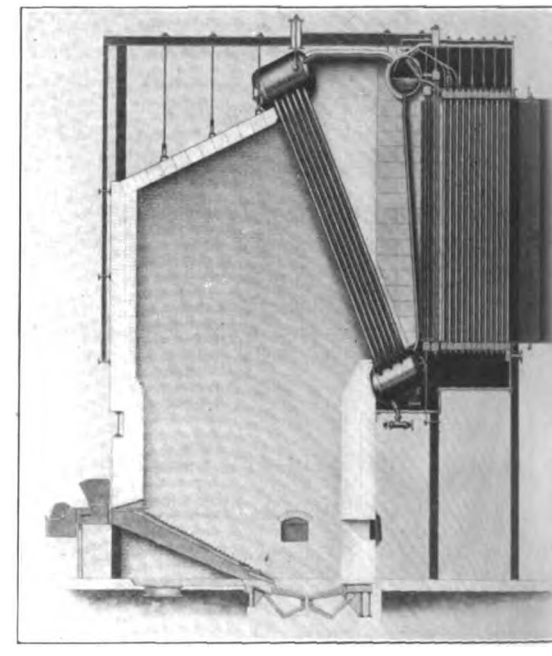
The HERTNER ELECTRIC COMPANY
W. 112 th. Street Cleveland, O. U.S.A.

The Edge Moor Single Pass Boiler

A NEW development in the power field, yet not so new as to be untried, is the Edge Moor Single Pass Boiler, of which a cut-away view is here shown. Briefly, this is a combination in one unit, of a single pass boiler, economizer, and superheater. A test installation at Binghamton, N. Y., has shown gratifying results and elicited much enthusiastic comment from engineers who have inspected this boiler in actual operation.

Each boiler is a compact steam generating unit, comprising a heating section proportioned to bring the water gradually to boiling point; a closed circuit steaming section, in which the water is vaporized independently of the heating; a sectional counterflow superheater, with temperature control; a soot-blowing system, with electric-motor-operated valves. An insulated steel casing, structural steel supports for mounting the boiler independently of building structural members, and the usual valves, water column, etc., are a part of the complete unit.

Among the features stressed by the manufacturers are the following: That there is an absolute counterflow of water and gases throughout the boiler, resulting in the highest possible temperature difference at every point.



The gases flow through a single pass from furnace to flue, without baffles; the contraction of the gas pass area being proportioned to temperature drop, a practically uniform gas velocity is maintained throughout.

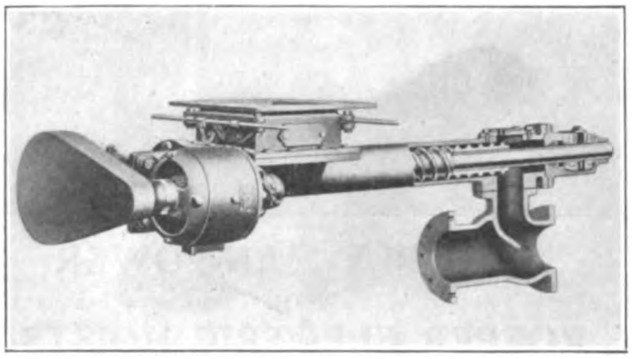
The number of tubes to a given furnace width exceeds that of multi-pass boilers by about 20 per cent., and the tube surface area exposed to radiant heat is about twice as much as in other boilers.

Superheat temperature control is accomplished by assembling superheater tubes in groups, with dampers in the spaces between groups. These dampers are operated by thermostatically controlled electric motors.

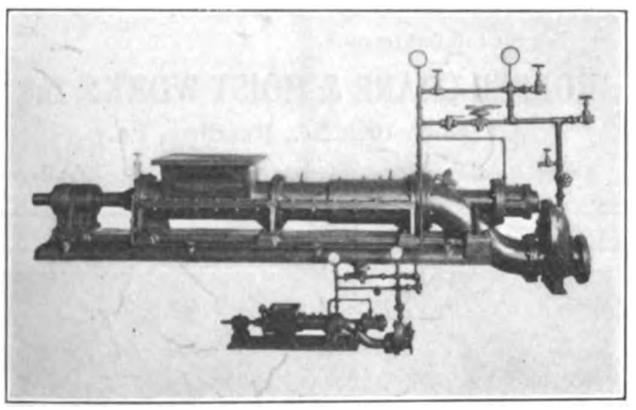
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Coal Burning Equipment at the Power Show

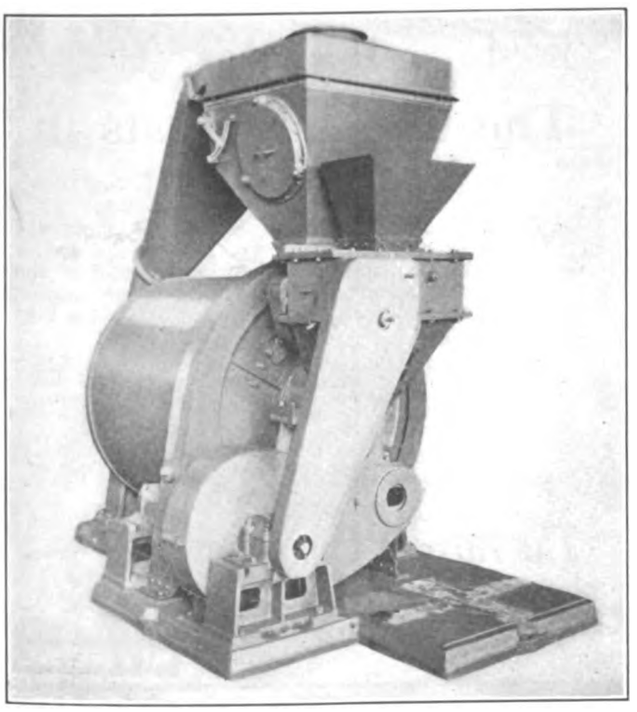
AMONG exhibitors at the New York Power Show, the Fuller-Lehigh Company, of Fullerton, Pa., is presenting a complete line of its equipment for conveying and burning powdered coal. The conveying system, incidentally, is in wide use for handling materials other than coal; such as cement, starch, powdered lime, talcum, etc.

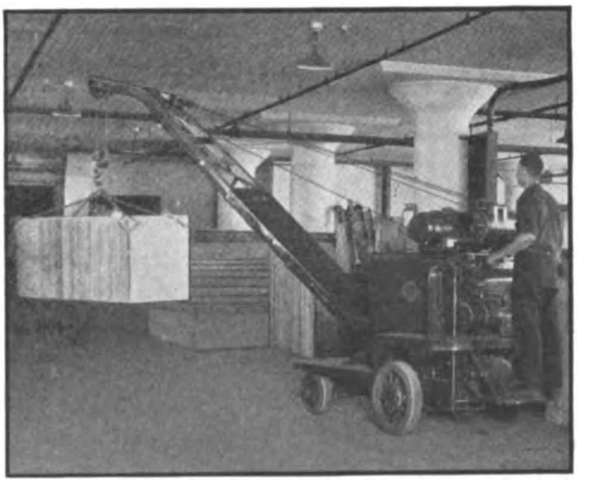


Above, Single-screw feeder, showing cross section of the mixing tee.



Two sizes of the pumps used for conveying powdered material are shown above. Below is a Fuller-Bonnot Unit Mill for direct firing of powdered coal furnaces.





Over $1,000,000 Worth of These Cranes in Daily Use

WHEN the whistle blows every morning hundreds of Elwell-Parker Cranes, like the one pictured above, go to work in nearly every branch of American Industry. Yards, shops and shipping rooms; wherever it may be, they earn their way and show a handsome profit.

Ruggedly constructed of alloy steels, Elwell-Parker Cranes always surprise by their performance in lifting and carrying. Flexible, economical, quick, dependable, they will bring new life and reduced costs to your business.

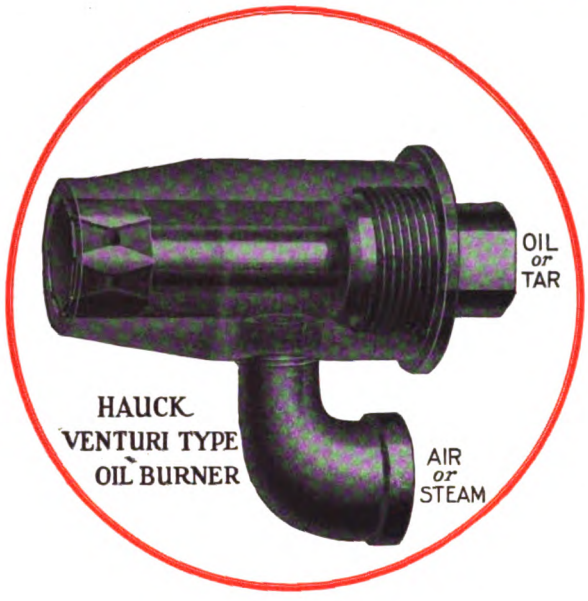
Every piece of equipment made by Elwell-Parker has been, and is, serviced by them. On the basis of service rendered to all Elwell-Parker equipment ever built these same portable electric cranes should still be serviced in 1935! No tructor is better than the service behind it.

Request bulletin No. 42

The ELWELL-PARKER ELECTRIC COMPANY
Cleveland Ohio

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HAUCK Venturi High Pressure Oil Burners



Reduce the Cost of Annealing Steel Castings

At the Monroe Steel Castings Company, Monroe, Michigan, where steel castings are made by the electric furnace process, four HAUCK Venturi Oil Burners, installed less than a year, already show remarkable savings in labor, time, wages and maintenance, in the annealing of these castings.

The Hauck Burners are placed two on each side of the furnace and the heating costs has been kept at $1.17 per ton of castings annealed. A Nielsen Survey shows the following savings:

The Savings Shown in Nielsen's Survey No. 38

Fuel—4,896 gallons @ .065	$318.24
Maintenance and repairs, labor on old burners eliminated—104 hours @ 75c	78.00
Savings per year	$396.24

HAUCK Oil Burners soon pay for themselves in the lowered time, labor, maintenance, and fuel costs. This installation, as described in the Nielsen Survey No. 38, will give you some valuable facts on low cost annealing. Send in the coupon and we will be glad to mail you a copy. We will also send you our complete catalog showing Hauck Oil Burners for every industrial purpose.

Hauck Manufacturing Co.

148 Tenth Street, Brooklyn, N. Y.

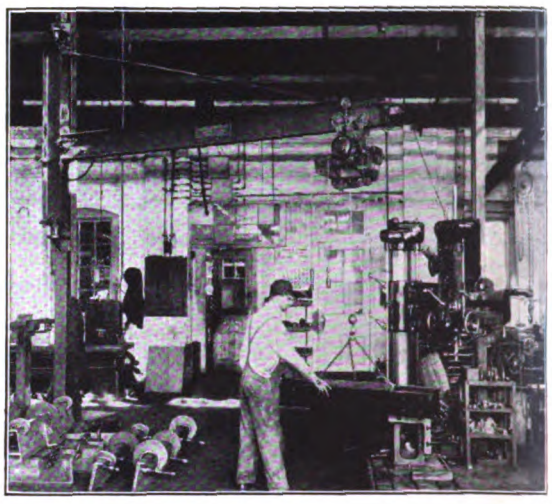
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HAUCK MANUFACTURING CO.,
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Company .....

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Keep the machines active so they produce the utmost.

The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

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ROEPER CRANE & HOIST WORKS, Inc.

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Traveling Cranes Electric Hoists Trolleys



The invisible costs in a can of paint

WHEN you paint anything around the plant, you pile up two invisible costs, besides the easily-seen cost of the paint itself. First, the cost of the temporary delays and possible shutdowns, and second, the cost of the painter's time, which is by far the biggest item of all.

There is a glossy black paint that hasn't got those costs mixed in it. That paint, Nitrose, stands extremes of heat and cold without cracking. It stands brine and sulphurous acid and hard wear. It outlasts ordinary paints by two or three times. And so it saves that big cost of repainting.

Do you want to prove for yourself the economy of Nitrose, the paint that lasts? Then drop a card for a test sample, or shall we send you a man who knows his business?

The Nitrose Company

Peoria Life Bldg.

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Modern Appliances Making the Boiler Plant Nearly Automatic

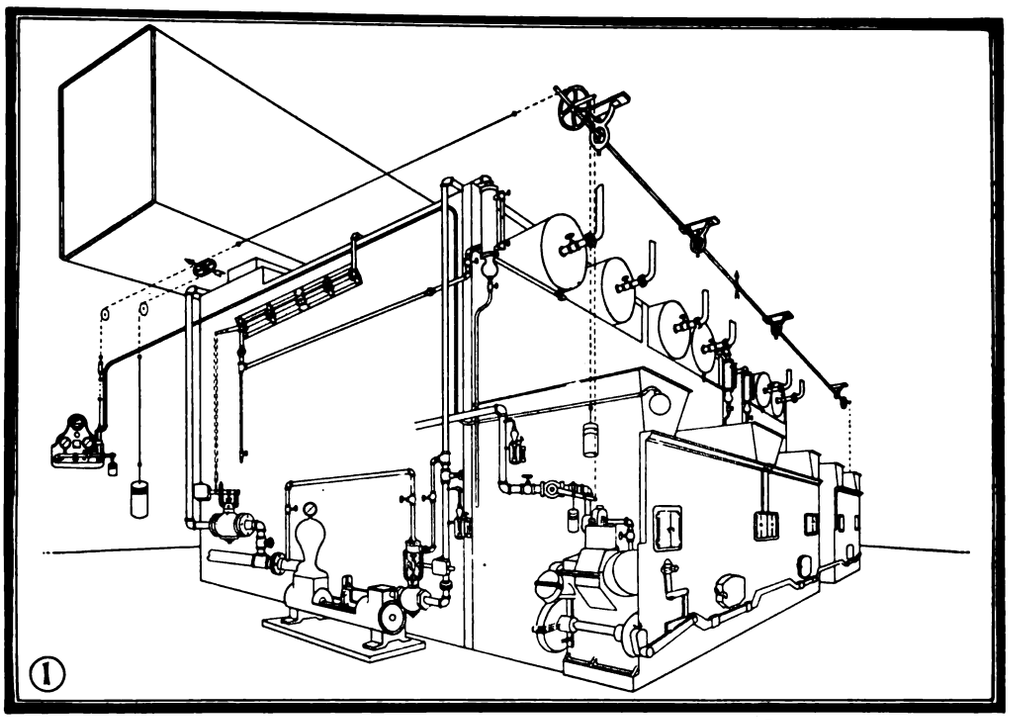
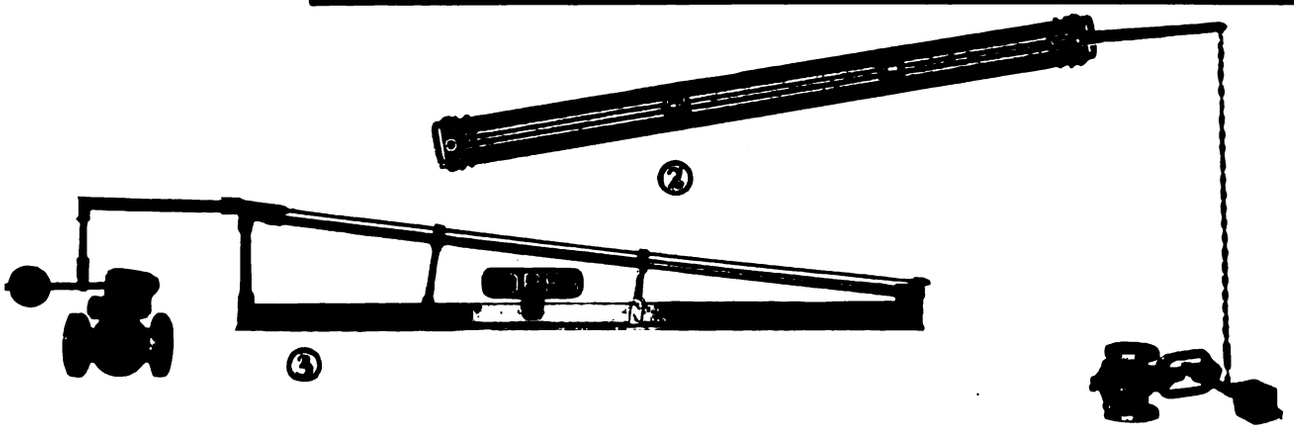
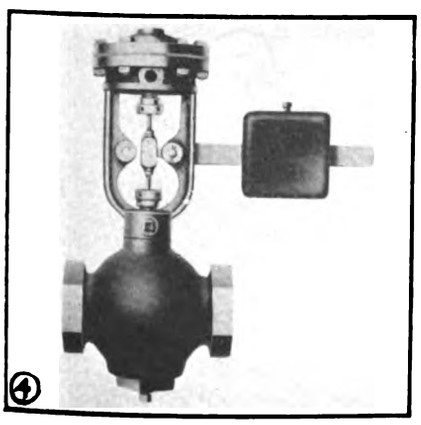
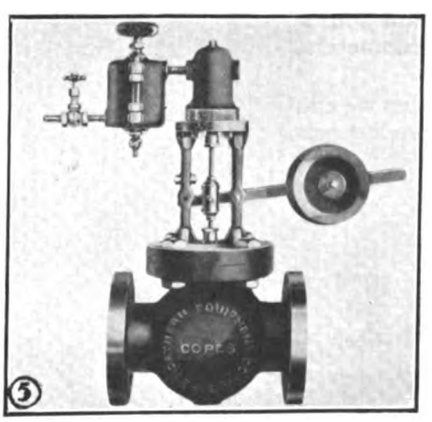


Fig. 1. This diagram illustrates how all the factors employed in the generation of steam, namely, coal, air and water, may be automatically controlled, saving coal, furnaces, boilers and labor. On this page are shown photographs of the apparatus used for these purposes

Courtesy McDonough Coal Saving Corp., Detroit, Mich.





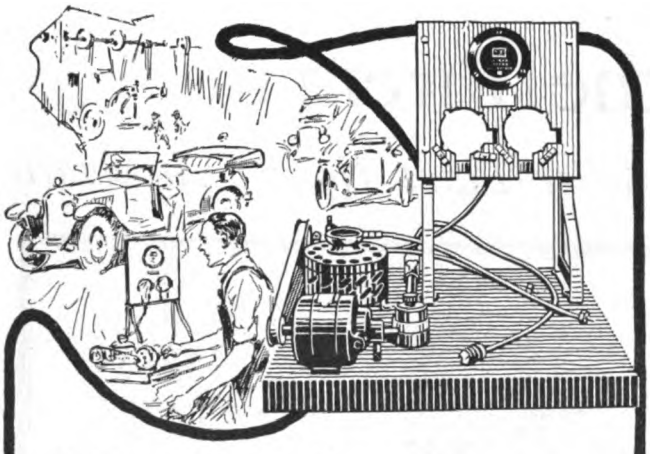




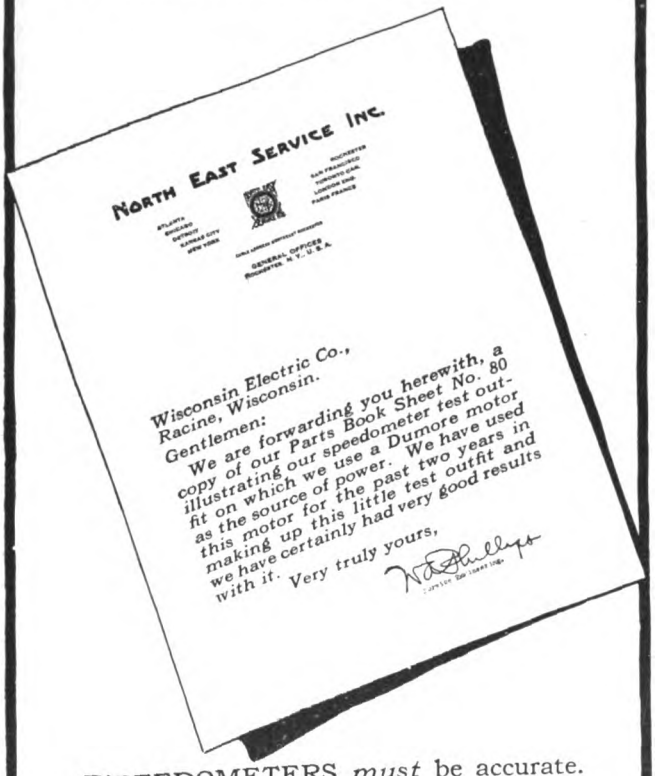
Figs. 2, 3, 4, 5 and 5A. The boiler water tender has been replaced by modern feed water regulators which give higher temperature to the feed water, insure proper rate of feeding in accordance with steam demands and therefore save fuel.

Courtesy Northern Equipment Co., Erie, Pa., and McDonough Coal Saving Corp., Detroit, Mich.

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Why Your Speedometer Is Accurate!

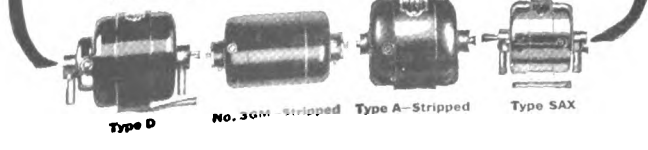


SPEEDOMETERS *must* be accurate. So when the North East Service Inc. needed a smooth, even, dependable source of power for testing their speedometers, they naturally came to Dumore.

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Fractional H.P. Motors



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HACK SAW BLADES

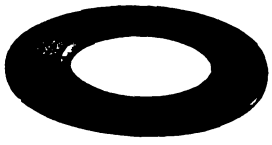


"MILFORD" Brand—All hard tungsten steel for cutting solids such as tool steel, rails, etc.



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"MIL FLEX" Brand—The Wavy set blade Soft-back tungsten steel practically unbreakable, for cutting pipe, BX, Sheets, Conduit, etc.

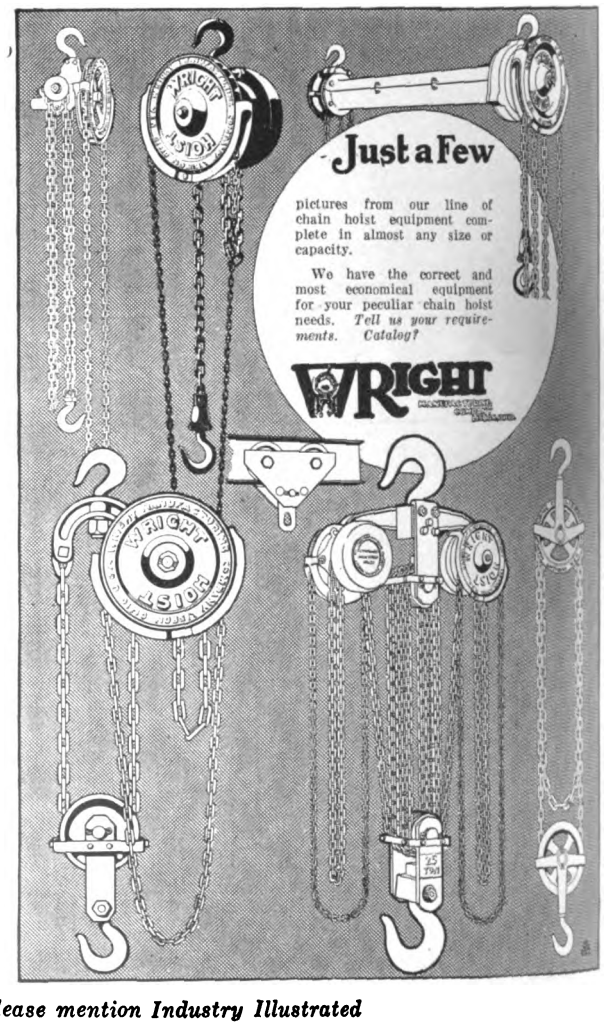


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Sample band or hack saw blade sent on request.

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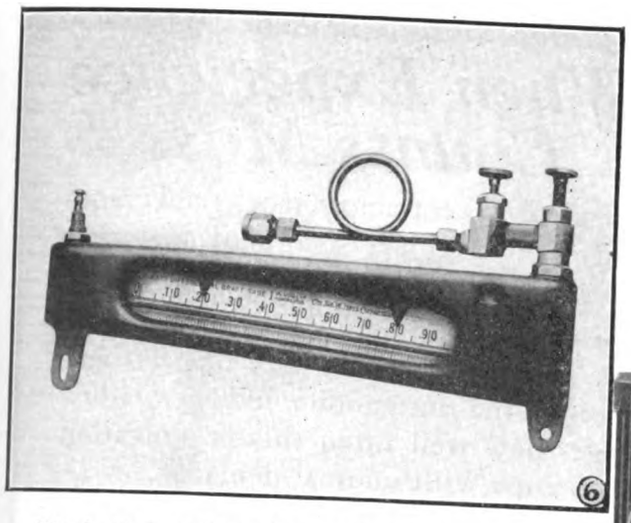
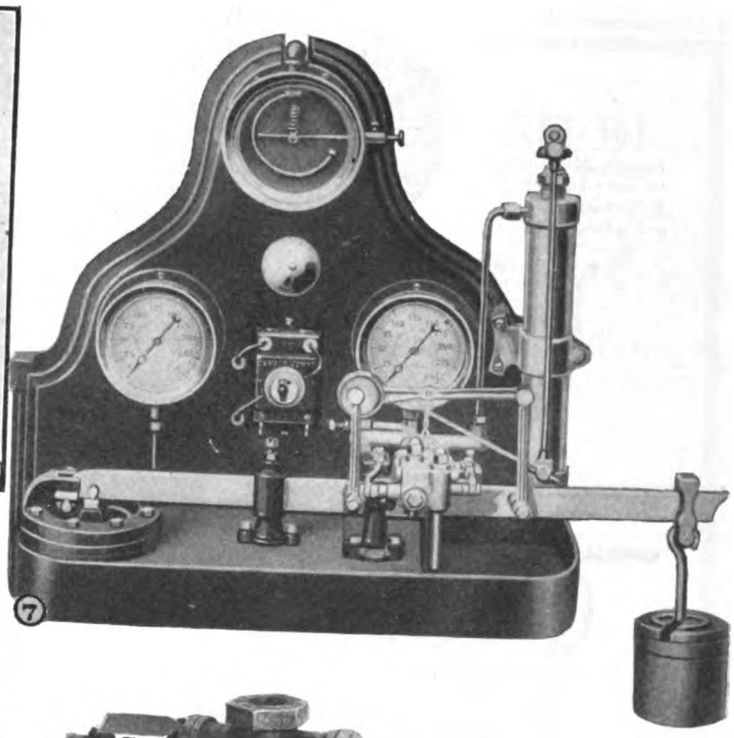


Fig. 6. Air is perhaps the most important element used in the power plant. While it is invisible its action in the form of furnace draft is made distinctly visible by draft gages such as shown above.

Courtesy Jos. W. Hays Corp., Michigan City, Ind.





Figs. 7 and 8. Draft and rate of coal feeding have a definite relationship and may be jointly controlled by the automatic apparatus shown here which regulates both the temperature opening and the stoker engines.

Courtesy McDonough Coal Saving Corp., Detroit, Mich.

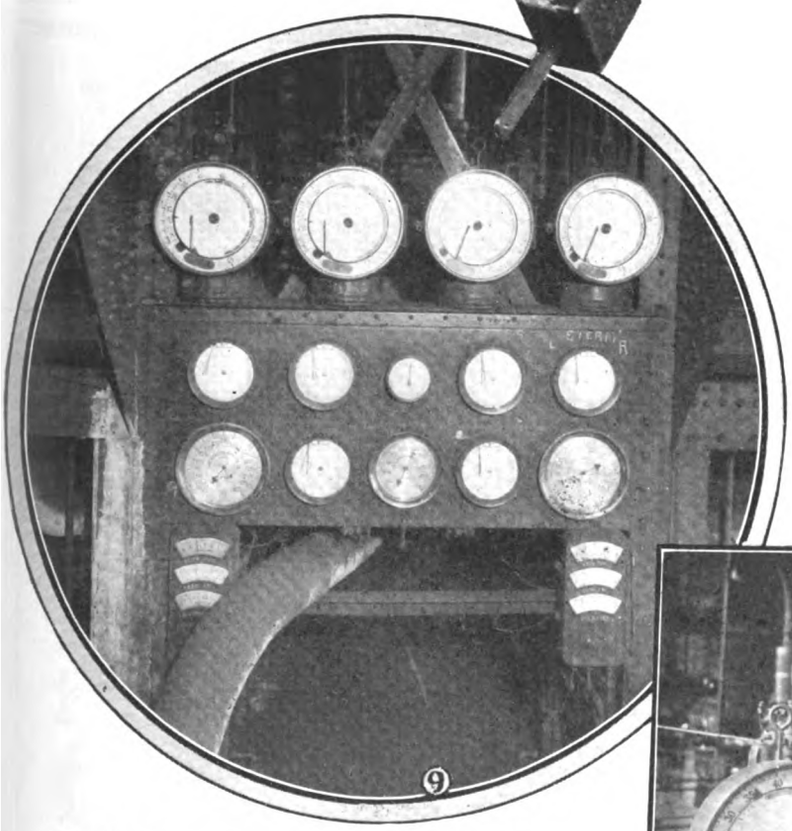


Fig. 9. Guesswork is expensive in the boiler room. Modern practice with instrument control leaves little to the imagination as indicated in this instrument panel. Note the steam flow meters at the top.

Courtesy General Electric Co., Schenectady, N.Y.

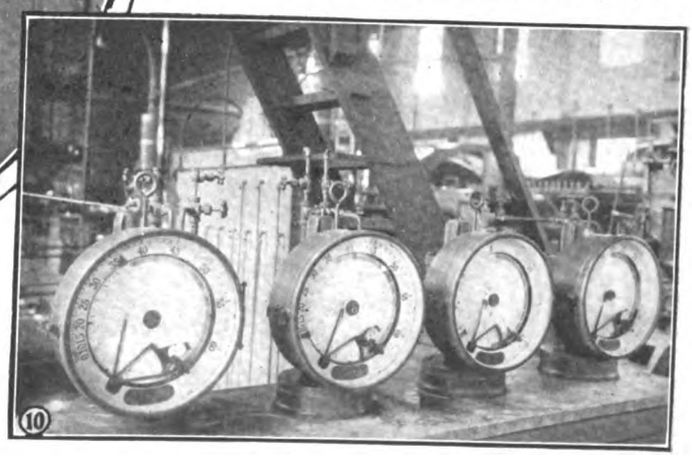


Fig. 10. One must measure the product in order to arrive at its cost. Steam is no exception. Integrating flow meters on main steam headers give an accurate account of distribution and consumption.

Courtesy General Electric Co., Schenectady, N. Y.

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Bulletin 26 describes the complete line of Baker tractors, trucks and cranes.

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Standard Baker tractors, trucks and cranes cover the ordinary range of material-handling requirements in every industry.

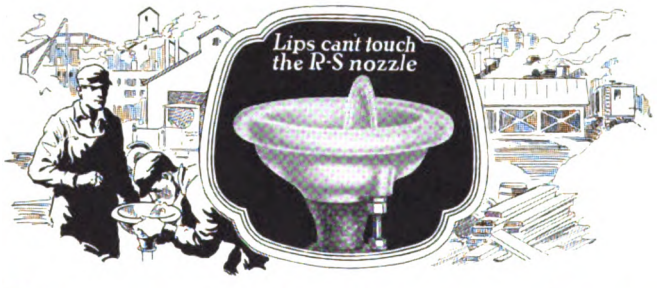
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THE BAKER R & L CO., Cleveland, Ohio

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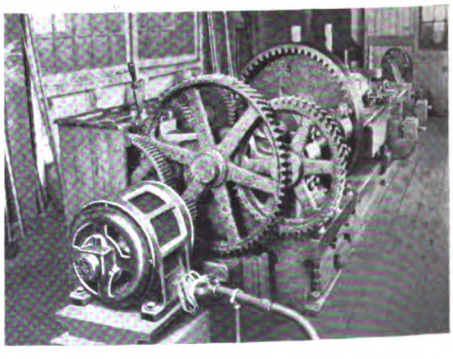
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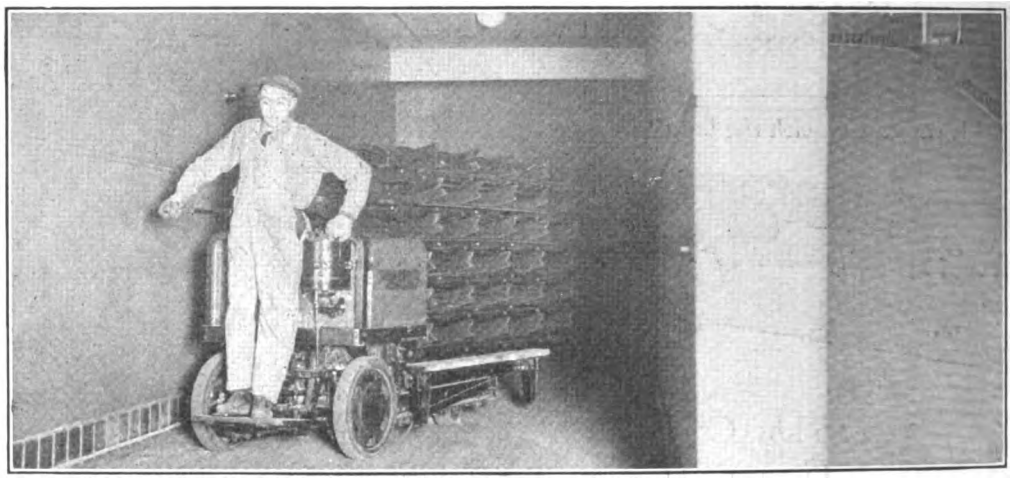
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RESERVE POWER Unique features of Exide-Ironclad construction enable the battery to discharge current at many times the normal rate without injury. At a touch of the controller this battery supplies the flood of power needed when a heavily loaded truck or tractor must surmount heavy grades or other hard pulling.

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THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

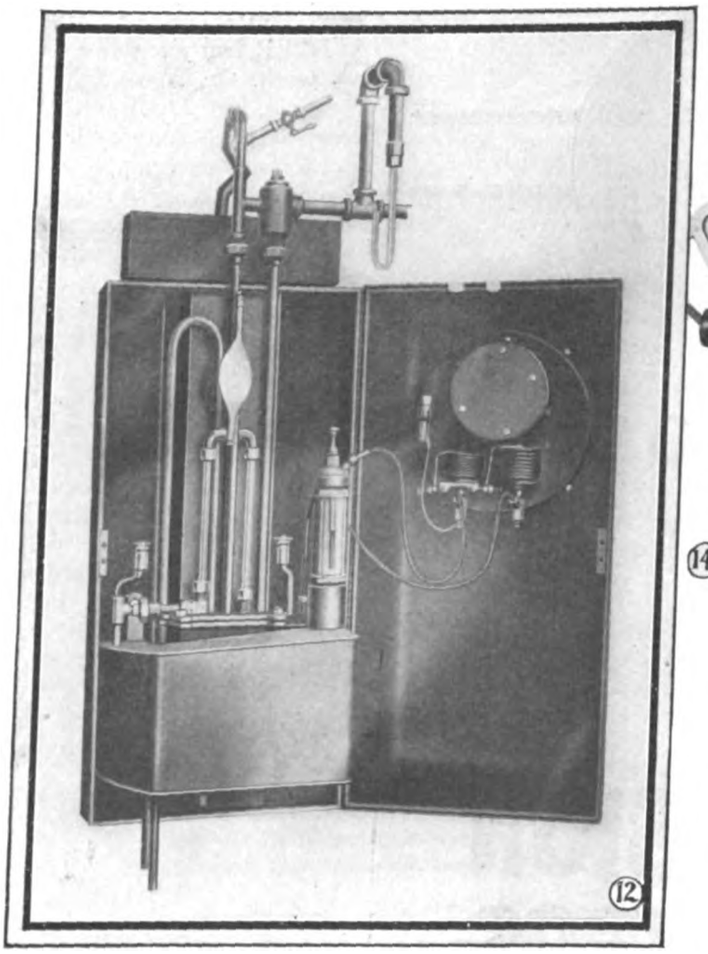
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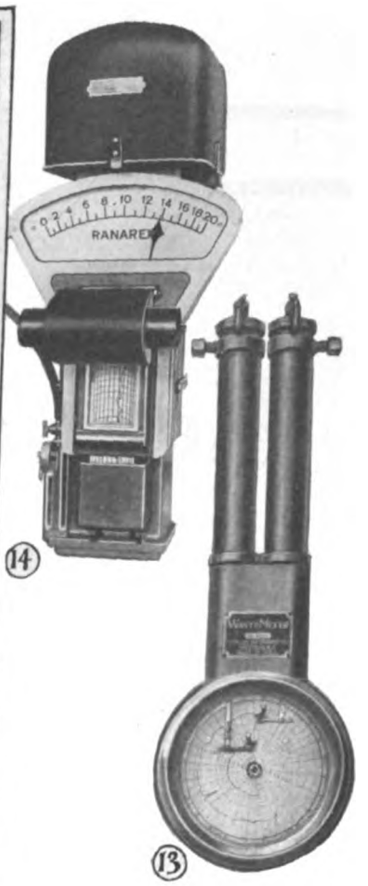
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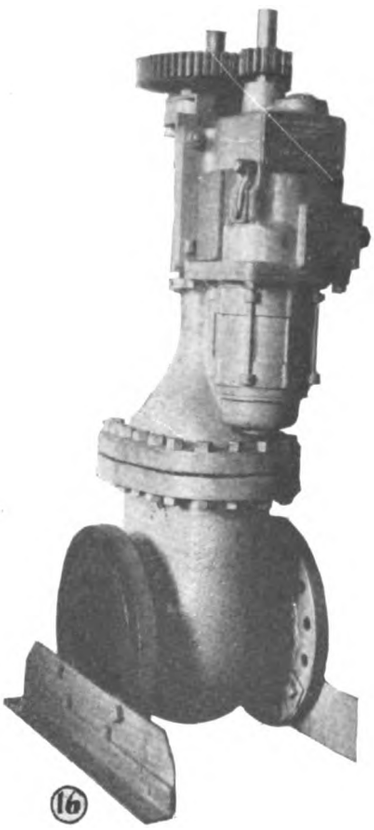
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Figs. 11, 12, 13, and 14. The most accurate indication of furnace efficiency is the CO_2 content of the exhaust gases. It tells whether or not dollars are escaping via the smokestack. These automatic instruments are real chemical laboratories which give a continuous analysis of the flue gases and render an unbiased and unimpeachable verdict of furnace efficiency.

Courtesy of Jos. W. Hays Corp., Michigan City, Ind., Uehling Instrument Co., Paterson, N. J., and the Permutit Co., New York.



(15)

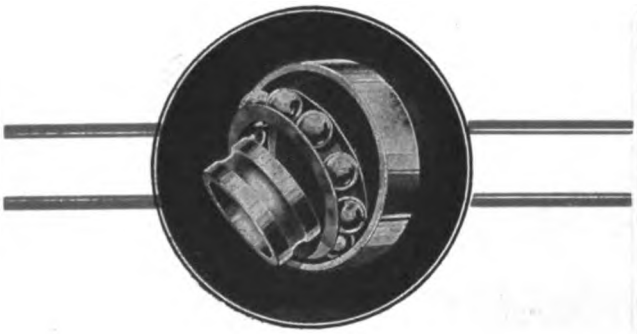


(16)

Figs. 15 and 16. Even the opening and closing of valves has become automatic. A push of the button is all that is necessary to close this steam valve or open it. Colored lights on the control panel tell what is happening.

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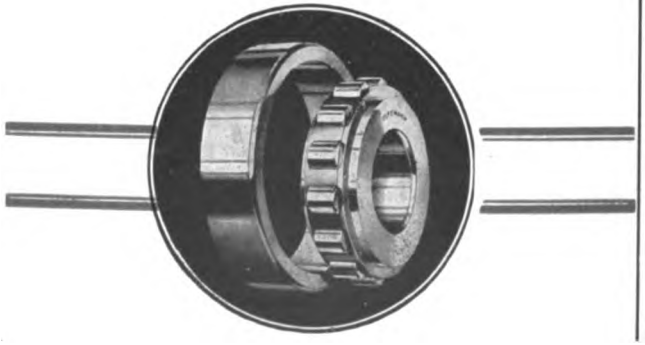
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NORMA-HOFFMANN BEARINGS CORPORATION

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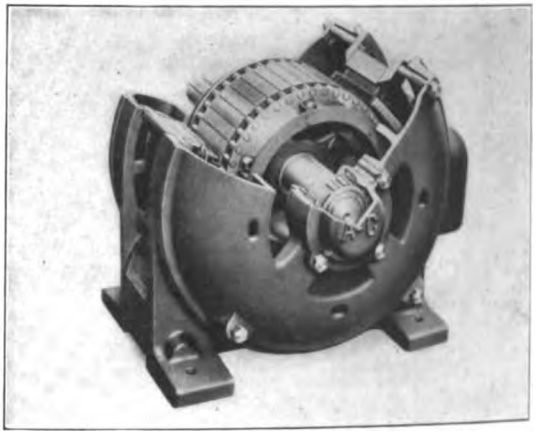
PRECISION BALL, ROLLER AND THRUST BEARINGS



New Line of Allis-Chalmers Motors

AFTER two years of experimental and development work, the Allis-Chalmers Mfg. Co., Milwaukee, Wisconsin, has placed on the market a complete line of twenty-five and sixty cycle squirrel cage and slip ring induction motors equipped with Timken Tapered Roller Bearings. This is in addition to the Company's well known line of sleeve bearing motors. The manufacturers state that the Timken bearing was selected only after very careful consideration of the many questions of design and operation. After designs of bearings and mountings had been made, a number of motors of various sizes were built and tested under actual operating conditions of belt, gear, chain and coupled drives, a sufficient length of time to insure satisfactory service before the line of motors was offered to the trade.

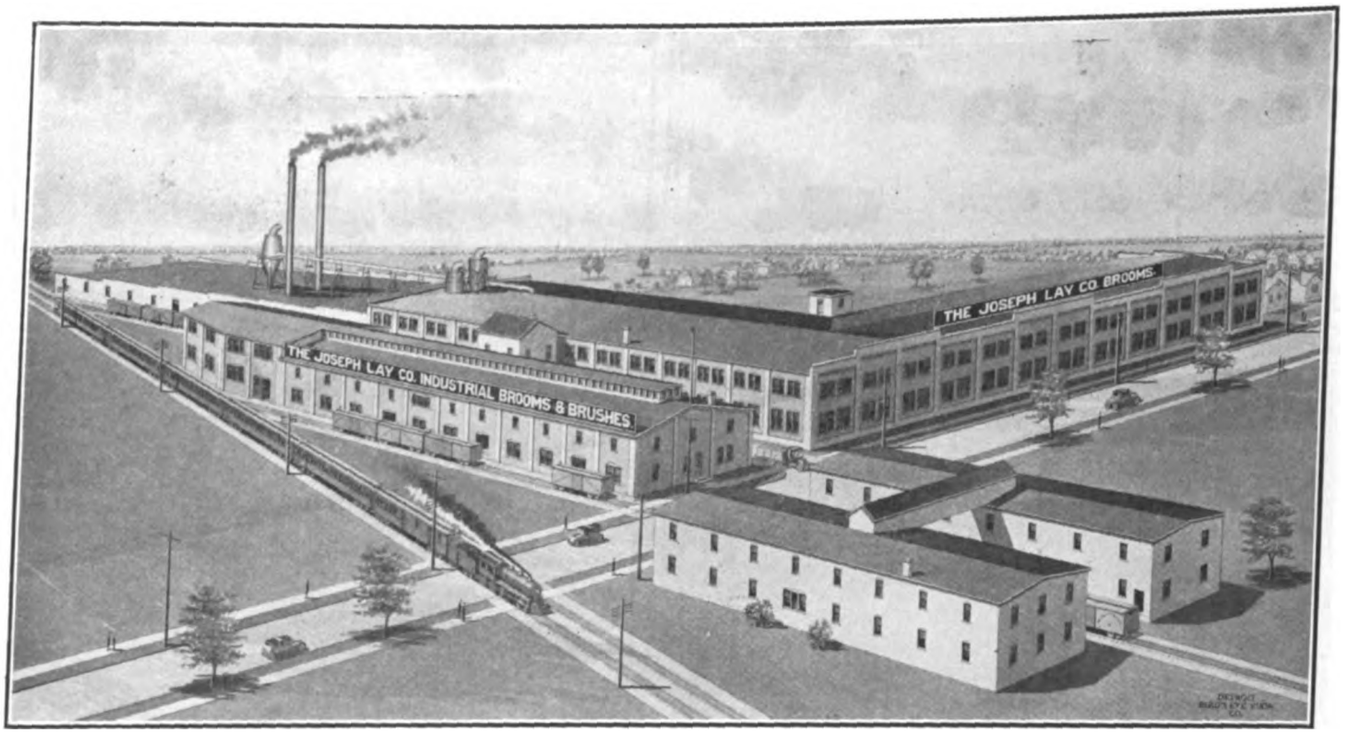
The important question of lubrication is claimed to be greatly simplified, as grease is used, requiring very infrequent attention on the part of the operator. This is a very important point, because it has been found from experience that a great many motor troubles can be



traced to improper lubrication. The bearings have grease tight enclosures effectively excluding dirt or abrasive matter that might cause undue wear of the bearings. The mounting of the bearings is very simple, being only a light press fit for both the cone and cup, and not requiring the use of a lock nut or other means of holding the races in place. This also facilitates the removal of the bearings whenever necessary.

In addition to the bearings, special attention has been given to many other features of design of this line of motors. This motor has to meet the many severe conditions found in its application to the various types of machinery manufactured by the company. The frame is made of steel with feet cast integral, to withstand shocks encountered in use with the company's crushers, grinders and other machinery. In applying the motors to the company's centrifugal pumps, very often severe conditions of moisture are met, so the coils are thoroughly insulated and baked in a water-proof varnish. In saw mills, flour mills and cement mills motors must operate in very dusty and dirty places, so that the scheme of ventilation must successfully meet these conditions. The openings in the housings and frames for ventilation are so placed in vertical planes that falling objects cannot enter the motor. The roller bearing motor is particularly adapted to many applications because the overall length is considerably less than for a sleeve bearing machine.

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THOUSANDS of satisfied customers, millions of Lay quality brooms, made this wonderful new plant possible.

Equipped with the most modern methods for broom and brushing making, our tremendous output and steady production make low prices and quick shipments possible. You save in the rewards of the business.

In 1876 the Lay Metal Case Broom was born; it has been imitated, but on quality alone it has won recognition wherever it is used.

Day after day Lay Brooms have strenuous duty to perform; they are tested and certified for your particular job. We are experts on brooms and sweeping conditions; you get the best that can be had—"the standard since '76."

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The First 15 Sold 50 More

AN original installation of 15 Valley Motors was placed in the factory of the Lampe Shoe Company the middle of 1922.

The work which these motors have to do consists of the pulling of line shafts, floors, and individual type shoe machine units. They run continuously all day long, and they are subject to frequent considerable overloads.

Since these motors were installed their performance has been so completely satisfactory that the management of this factory has installed more than 50 additional motors and assures us that future motors will be Valley Motors.

This is only another illustration of the service and satisfaction which buyers regularly get from Valley Ball Bearing Motors.

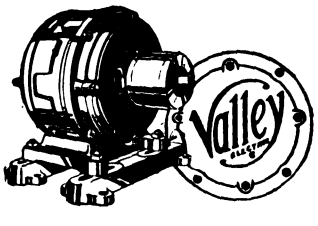
The delivery of continuous power with unusual operating economy and complete operating satisfaction is all in the day's work for Valley motors.

Before you buy or recommend another installation of motors, it will pay you to get all the facts about Valley Ball Bearing Motors. Write for descriptive booklet.

Motor Division

VALLEY ELECTRIC CO., ST. LOUIS, U S. A.

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Valley Electric

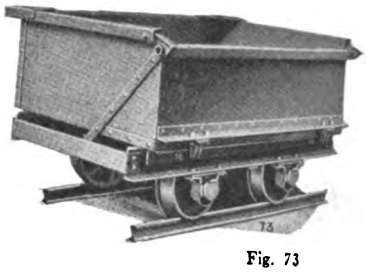


Fig. 73

EASTON CARS
Coal Charging Type

This car is standard in 20 to 40 cubic feet capacity or for 1000 and 2000 lbs. of coal.

The door drops down flush with the bottom to permit the coal being shoveled easily and directly into the boiler. The use of these cars insures a check on the coal consumption and avoids waste of coal and dirty floors in the boiler room.

This and many other types of industrial equipment is shown in our 1925 catalog.

EASTON CAR & CONSTRUCTION CO.

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Why Dry Steam?

ANDREWS-BRADSHAW COMPANY, 530 Fourth Avenue, Pittsburgh, Pa., submit this as a good illustration of the effect of ordinary steam containing one-half of one per cent. of boiler water (or more). Steam like this carries tons of impurities away from the boiler every year. The impurities cut turbine blades, erode cylinder walls, wear out rings, cut valves (see illustration), increase need for cylinder oil, plug traps, meter leads, steam pipes, etc.



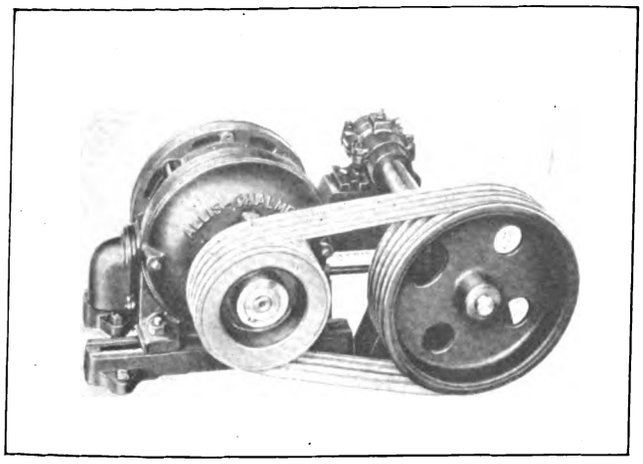
A new bulletin just issued by that company tells how and why the Tracyfier removes every vestige of boiler water from steam before it leaves the boiler drum. Tracyfiers will be exhibited at both the New York and the Chicago Power Shows.

A New Short Center Belt Drive

THE Allis-Chalmers Mfg. Co., of Milwaukee, have recently announced an entirely new type of short center, flexible drive, known as the Texrope Drive.

The Texrope Drive consists of two grooved sheaves and a number of specially constructed endless "V" belts. The sheaves are set just far enough apart so that the belts fit the grooves without either tension or slack.

Since the Texrope belts just fit the sheaves, there is said to be no slack or lost motion in the drive. Because of the "V" construction, they cannot slip, as the harder the pull the more firmly the belts grip the grooves. Being elastic and stretchable, the manufacturers claim that they cannot jerk, either in starting, acceleration or running, nor can they transmit vibrations, but act as cushions between the driving and driven machines.



Texrope Drives from ½ to 250 hp., with ratios up to 7 to 1 and belt speeds from 800-6,000 feet have already been placed in service.



Do You Buy Steam Traps by the Pound?

That's virtually what you do when you pay three or more times as much for a bucket or float trap as you would have to pay for a Sarco.

A 200-lb. trap won't do any more or better work than a 10-lb. Sarco. So why pay about $110.00 for 190 lbs. additional iron in the heavier trap when you could buy that much iron for $19.00?

Of course, you get about thirty-five additional parts in the big trap not found in

SARCO STEAM TRAP

But a greater number of parts means more parts to get out of order and to carry in stock.

The No. 9 Sarco Steam Trap is of the self-adjusting balanced-pressure type. Is suitable for any steam pressure from 0 to 100 lbs.

Let us send you a Sarco on 30 days' free trial without obligation on your part. It will only take a few minutes to screw it into your pipe-line and give it a trial. And it may be the means of saving you hundreds of dollars.

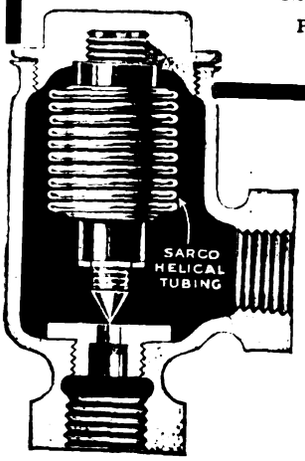
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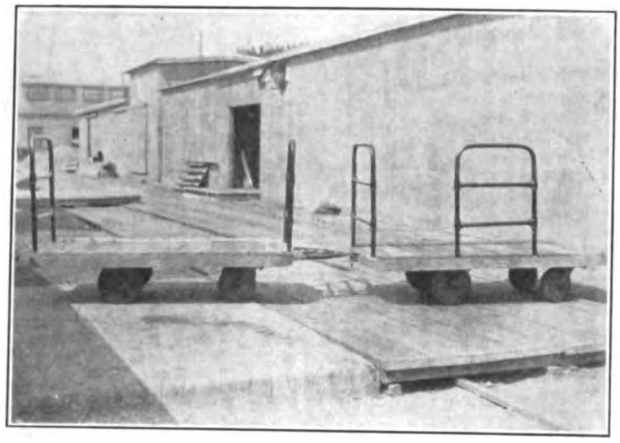
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Sarco Co., Inc.,
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Please send us on free trial 1 No. 9 Sarco Steam Trap as follows:
Size .....for pressure of ..... lbs.
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WHY?

Ask your neighbor, who uses these silent wheels, and saves his floors.

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Better still, write for booklet telling why 75% of the business for Metzgar Wheels consists of repeat orders.

All wheels must make good—or we will.

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Put your fan and blower troubles up to us . .



Don't make the mistake of buying power wasting, inefficient fans and blowers when for the same price you can get Buffalo.

We have a fan or blower for every kind of work. At the left is a planing mill exhauster for handling shavings, sawdust, chips, lint, dust or other waste material. Also made in the famous Buffalo "Slow Speed" type which has a greater efficiency than any other fan made. Either type is highly satisfactory for ordinary exhaust work. We can also supply dust collectors and blast gates.



At the right is a Buffalo "Baby Conoidal" fan for blowing or exhausting. Used for ventilating stock rooms, toilets, cleaning rooms, lunchrooms, etc. Sturdy construction and silent operation make this fan popular. Made in complete range of sizes.



The Buffalo "B" Volume Blower at the left is also made for exhaust work; the blowers being used principally for supplying forced draft to various types of furnaces where pressure up to 6 oz. is required, and for ventilating mines, etc., while the exhausters are suitable for handling smoke and gases from forges, removing dust from emery and buffing wheels, tumbling barrels, etc. Made in complete range of sizes.



For work requiring a compact, efficient, low-priced blower we recommend the Buffalo Type "E" Variable or Constant Speed blowers. These sturdy outfits deliver a surprising amount of air, stay on the job, and sell at a low price.

If you want to know more about these or other Buffalo fans, write for catalog 860.

See Our Exhibit at the

Fourth National Exposition of Power and Mechanical Engineering

Grand Central Palace, New York, Nov. 30th to Dec. 5th, 1925

BUFFALO FORGE COMPANY

440 Broadway Buffalo, N.Y.

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More Power for Less Money

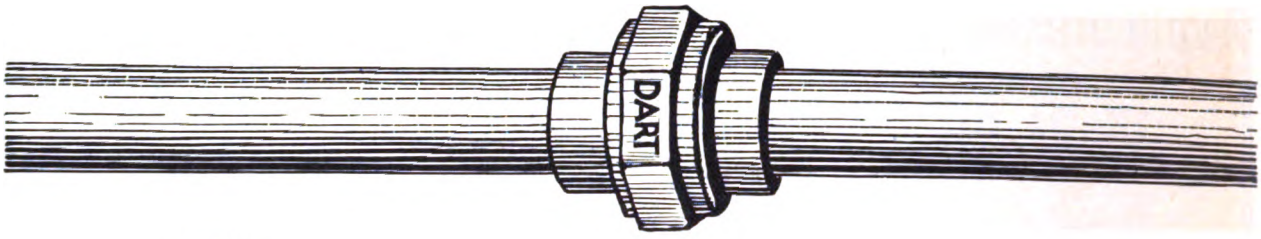
More power for less money should be the aim of every factory executive and industrial manager.

It is a practical aim and a paying one. It is practical because nearly one half of the fuel now burned for power is actually wasted and because there are other numerous wastes in power generation that can easily be eliminated.

It is profitable because the cost of power, as disclosed by our investigations, amounts to nearly one fourth of all wages paid. Think what this means if you can reduce your power bill even twenty per cent.

On the following pages are shown the modern and tested equipment that will help you get more power for less money.

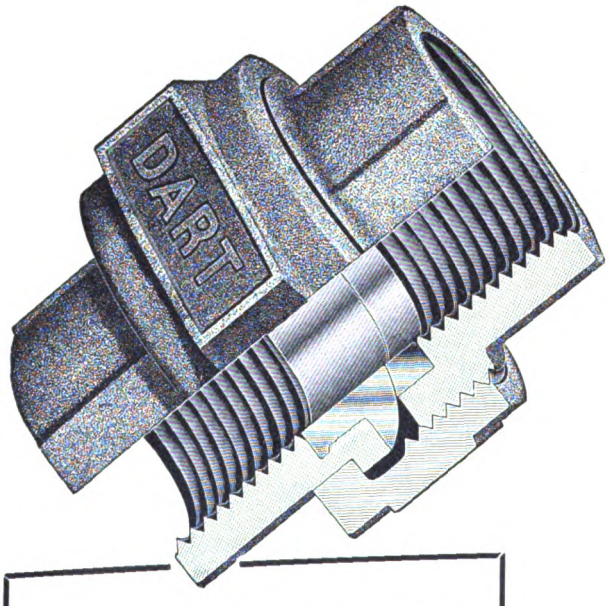
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Every Joint Should be Guarded Against Steam Wastes—

Every steam joint is a vital point in your plant. Escaping steam or any defects in the unions used cost you money and sometimes this loss is enormous. Guard against this waste with *Dart Unions*, the steam unions with the absolute guarantee.



DART UNIONS Always Stay Tight

Bronze to bronze seating surfaces are ground together into an absolute tight seating ball and socket joint. Bronze cannot corrode or rust—therefore tight joints are positively assured. And for the same reason Dart Unions last indefinitely and are used over and over again when steam lines are replaced.

Made in all sizes to meet every requirement. Read our guarantee.

The Dart Guarantee Protects You

Any Dart Union that leaks as a result of defective material or workmanship will be replaced free of charge by TWO DART UNIONS of the same size.

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The Fairbanks Co.

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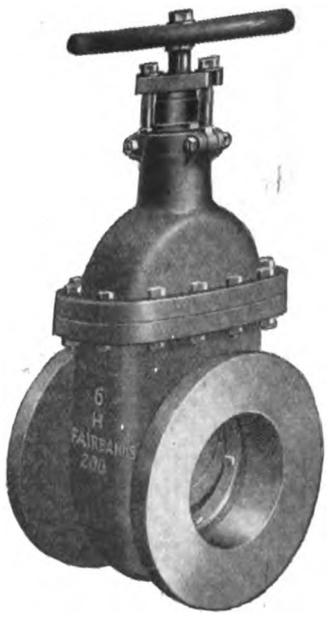
DART UNIONS

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December, 1925

The FAIRBANKS SERVICE

To Help You Lower Power Costs



The nearest Fairbanks office is ready to serve you with Renewable Iron Body Gate Valves that have revolutionized valve maintenance and repair.

With the Fairbanks Iron Body Gate Valves new seat rings and other replacement of parts are made by one man, (formerly two men required with old-fashioned valves) and without taking the valves from the line.

Write to the nearest office for full particulars.

We also handle Dart, the guaranteed leakproof Unions.

Fairbanks Renewable Iron Body Gate Valves



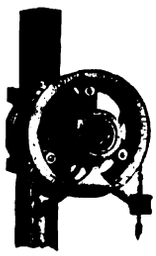
Fig. 0302



Fig. 0310



Fig. 0313



Babbitt Adjustable Sprocket Rim with Chain Guide

A "Safety First" Requisite

Any valve, no matter how high it is placed can now be operated with a Babbitt Chain and Sprocket. It does away with the treacherous step ladder and any one can operate it from the floor with safety. Just what you want for the out-of-reach valves.

THE FAIRBANKS CO.

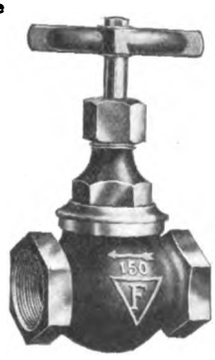
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Every part is renewable in a "Fairbanks-Vulcabeston" Ring Disc Globe Valve. A new Vulcabeston Ring Disc furnished for every unsatisfactory one returned.



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REED AIR FILTERS Safeguard the Air at Bowman Dairy

Utmost precaution is required in the handling of a big city's milk supply. The Bowman Dairy Company, of Chicago, demanded ventilating air free from every trace of dust and bacteria. They selected Reed Air Filters to provide it. There is no better proof of the effectiveness of Reed Air Filters in dust removal than their successful operation where requirements are as rigid as in plants of this kind. *Send coupon for free bulletins.*

SAFEGUARDING the Most Perishable of Foods

No food is more important to human health than milk—no food is more perishable. It was a logical step, therefore, when the Bowman Dairy Co., of Chicago, one of the largest distributors of this essential food, chose Reed Air Filters as the most efficient means for removing dust and bacteria from the air that enters its plant. Reed Filters are guaranteed to remove 97% of all foreign matter from the air and to insure maximum cleanliness at minimum cost and with least resistance to air flow.

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REED AIR FILTER COMPANY, Inc.
211 Central Avenue, Louisville, Kentucky

Gentlemen: Please send me, without obligation, the bulletin on the Reed System of Air Filtration.

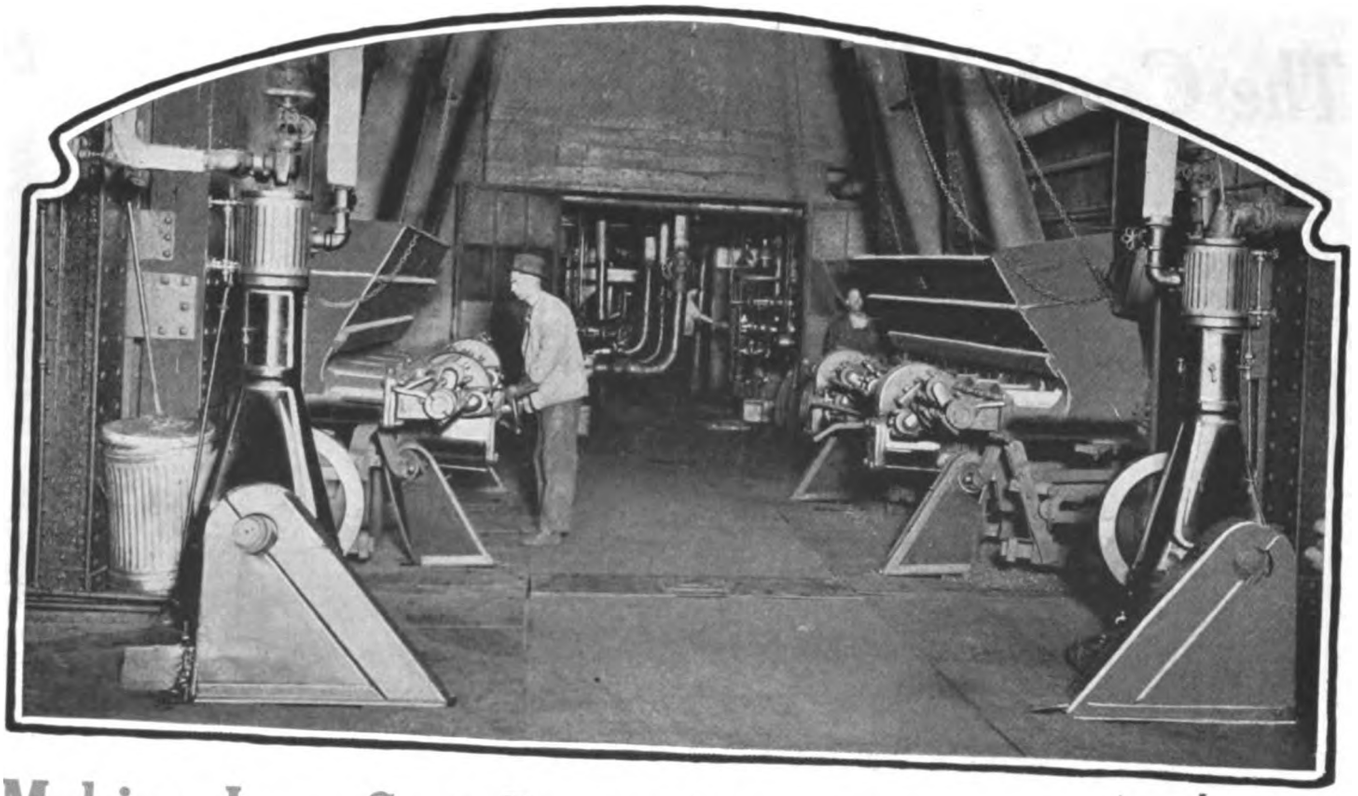
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(*REED AIR FILTERS are manufactured under patents of May 16, 1922, Feb. 12, 1924, Nov. 18, 1924. Other patents pending*)

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Making Low Cost Power Possible For 34 Years

From the beginning every effort was made to design and build a steam engine which would operate for years and keep down the cost of power to the minimum.

During the past 34 years Troy Engines have been in use for driving generators and auxiliaries, for stoker operation, for fans and pumps; and their exceptional performance under all conditions has justified our work in making "only steam engines, good engines only."

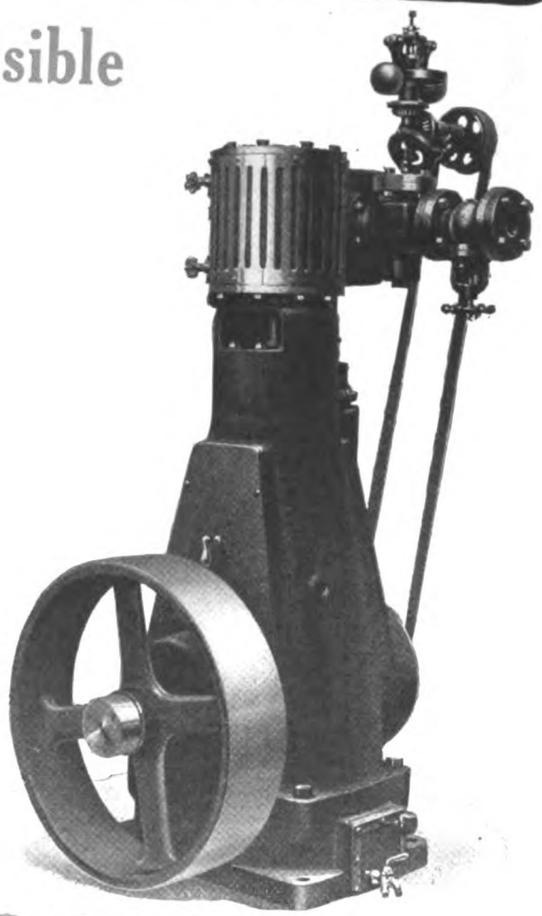
Because of our specialization—an entire plant devoted to the making of steam engines only, the location of the Troy plant, where low freight rates are assured, the pleasant working conditions, and economical production methods as well as our own foundry; it enables us to produce an engine of high quality and to sell it at a reasonable price.

Troy Engines assure economical operation under all conditions. Relatively long connecting rods, properly balanced reciprocating parts and positive lubrication of all wearing surfaces.

Excess condensation is instantly relieved from cylinder, assuring safe operation.

Furnished in capacities to 200 Brake Horsepower.

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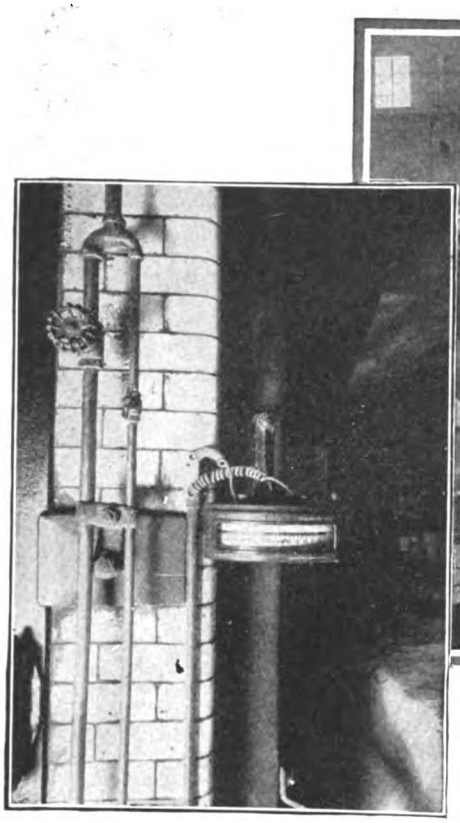
TROY ENGINES

Dependable Power with Absolute Safety

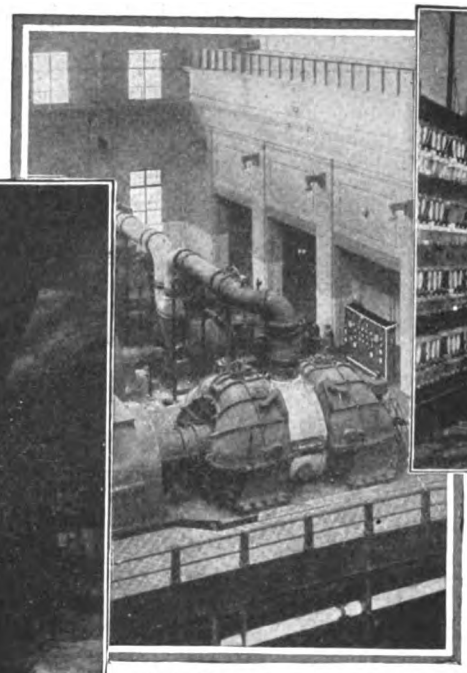
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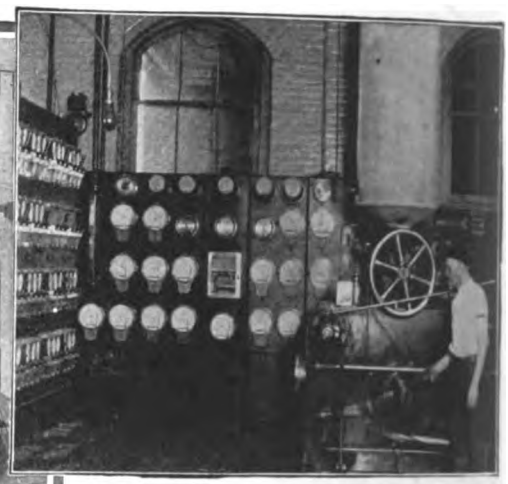
The Control of Temperatures Makes



Tycos Recording Pyrometers keep an accurate check on stack and furnace temperatures in the boiler room of this plant, keeping firemen posted on their furnace efficiency.



A turbine room of a large utility company where *Tycos* Instruments indicate pressure and vacuum. 152 *Tycos* Instruments have been installed in this plant.



A switchboard mounted with *Tycos* Instruments for indicating and recording steam temperatures and pressures, for a battery of boilers—also a record of steam to various parts of building.

Power plant efficiency and low cost operation are mainly a matter of temperature control.

In comparing the operation of the modern plant and that of a few years ago, the main difference results from an accurate knowledge of temperatures from the boiler where the steam is generated and on through the steam engines and turbines to the steam lines distributed through the industrial plant.



Tycos Instruments have had their share in bringing down the cost of generating steam by giving positive, accurate and reliable information and maintaining records of temperature, day by day and hour by hour, so that the engineer in the power plant and the man who foots the bills may know exactly if the most efficient operation is obtained.

Taylor Instrument Companies

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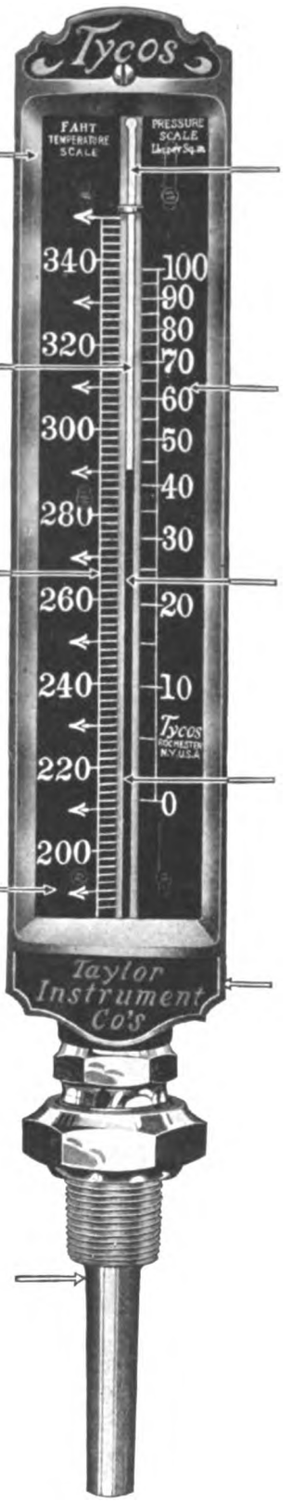
Power Plant Economy Possible

Tycos Temperature Instruments —indicating, recording and controlling—have been in use over 70 years. *Tycos* quality is incorporated in every instrument. In many power plants their use has become standard for every purpose where temperature recording and controlling is required.

We publish a number of catalogs which contain a great deal of useful information on temperature control in the power plant and throughout the plant. These include separate publications for the various industries and are available to all executives and engineers.

Tycos Service to Industry

Tycos Service includes the advice of a competent engineering staff ready to advise and consult with you on your temperature control problems. Write asking about this service.



Polished cast-bronze detachable front frames are interchangeable.

Space above mercury is filled with pure nitrogen gas under pressure, preventing separation of mercury column.

Scales are graduated for each individual tube, are accurate over the entire range, and are fastened firmly to the case, so they cannot slip.

Heavy glass front protects tube and scale from corrosion and mechanical injury.

Separable socket is machined and tapered to close limits, to insure perfect contact with thermometer stem. All sockets are interchangeable.

The glass thermometer tube is heat-treated, to remove strain, is aged to insure permanent accuracy, and is held firmly in place by our method of packing, so it cannot slip.

Large silver-deposited figures and graduations on black-oxidized background are permanent and easy to read.

Lens tubing selected for its magnifying quality is easy to read. Uniformity of bore gives evenly-spaced graduations.

Double-distilled mercury, with all impurities removed. Will not oxidize. The mercury bath in the chamber is sealed so it cannot leak.

Heavy cast-bronze case; durable black-enamel finish. V-shape section protects tube.

Tycos Temperature Instruments

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12 Industry Illustrated

The Control of Mechanical Power Transmission

Millions of Dollars are Annually Wasted Through Inefficient Transmission

*By William Staniar**

Belting and Transmission Engineer, E. I. du Pont de Nemours & Co.

THE power chain from the mechanical generation of power to its mechanical application is composed of three links—Steam, Electric and Mechanical. The mechanical, or final, link is generally the weakest in the average manufacturing plant today, because it receives the least attention during design and after installation.

The importance of this final link in the power chain is now being realized because research work has demonstrated that it can be made just as efficient as the other two, if proper attention is given to its design and proper supervision to its installation and operation.

Executives and plant managers have no idea, for example, of the actual waste of money and lowered production efficiency caused by the improper selection of power belting as to type, width and thickness and the misapplication of transmission appurtenances.

A belt driven production machine, any belt driven apparatus, is only producing efficiently just so long as its belt is running efficiently, and it cannot do that unless it is of the proper type for the surrounding atmospheric conditions and the proper width and thickness for the pulley design, speed and the power to be transmitted.

It is a fact of experience, and one that has always been difficult to understand, that a majority of executives and managers have always and still do, underestimate the vital importance of their power belting. They demand expert engineering skill for the production of their power and the selection of apparatus, always with the idea of maximum production at minimum cost, but when it comes to belting, the most widely used and indispensable link between that power and maximum production, they place the responsibility for its selection, design, installation and care upon untrained men who use old rule-of-thumb methods, their own limited belting experience and consideration of first cost only. This condition caused the ninety thousand dollar a year expenditure cited under the picture on this page, because it resulted in poorly designed drives, loss of power and depreciation of belting and transmission equipment, which together constitute a heavy and unnecessary percentage of production costs.

There is no doubt that the apparent lack of interest on the part of executives in this important matter is their failure to realize its vital importance

To find out whether you can save money on your belt transmission, ask yourself these questions:

1—What is our annual expenditure for new belting?
2—What is our annual belting maintenance cost?
3—How many belt repair men do we employ?
4—Who prescribes the belting we buy—the Purchasing Department or an experienced engineer?
5—Who determines the particular belt as to type, width and thickness for the particular drive—millwrights or an experienced engineer?
6—Have we any system for belting control—or is it just a hit-or-miss proposition?
7—What types of belting are we using and why?
8—Do we really know anything about the leather belting we are buying?
9—Do we buy leather belting on specification? If so, are our purchases checked and by whom?
10—What controls our leather belting purchases—quality or discount?
11—Have we investigated the possibility of substituting leather with rubber, hair, balata or canvas belting for some installations?
12—Do we pay any particular attention to the methods of joining our belting?



Fig. 1. "Mr. Executive, what is your annual expenditure for belting?" "I haven't the slightest idea." It was found to be $90,000 per year, or six per cent. on an investment of one and one-half million dollars. Ignorance of actual belting costs is the rule in seventy-five per cent. of our big manufacturing plants.

*See page 61.

and the possible losses involved. Therefore, it is the desire of the writer in this series of articles on belting and mechanical power transmission to create a picture in the minds of these men as to what may be going on in their plants and what may be done to stop the continuation of the waste.

It is the problem of the writer to keep these costs down to a minimum, to increase production based on belting and transmission and to lower the maintenance of these commodities. This has been and is being accomplished to a great extent by the writer's belting and transmission standardization system which is in operation in all large plants of the DuPont Company and two of the largest of the General Motors Corporation.

This system is a practicable and a simple method for using the right belt in the right place as to type, width and thickness because it is based on a detail study of the following facts of each installation:

1. Conditions surrounding the drive, such as acid fumes, heat, steam, moisture, dust, grit, etc.
2. Horsepower to be transmitted.
3. Ratio of drive.
4. Diameter and speeds of pulleys involved.
5. Center distance between driver and driven.
6. Method of control.
7. Angle of drive.
8. Kind and method of loading.
9. Method of joining.

This system, owing to its simplicity, has shown substantial savings annually for the plants using it because each installation is based on scientific investigation and not left to guesswork. Therefore, based on the experience and knowledge derived from these large industrial operations it is my purpose to place before you executives in succeeding articles of this series, in a definite way, how it is possible for the right belting and transmission installation in the right place to increase the profits of your company.

Mechanical and Purchasing Divisions of large corporations are, in the main, well organized and have sections for their various mechanical installations and raw material requirements, supervised by men who are trained in their particular line, but why is it that belting and transmission materials—those important and absolutely necessary links between power and production—are considered a side issue and are left to the fate of being bought on discount and selected, installed and operated by men to whom a belt is just a belt and a bearing just a bearing. There is just as much justification for a corporation studying and understanding its belting and transmission conditions and requirements as there is for it to study and investigate its raw materials, because the savings on raw materials are at times very small, but 75 to 100% is possible on belting in a great many cases.



Fig. 2. Remove the control of your mechanical power transmission from the hands of men who consider horsepower calculations too difficult and place it in the hands of an experienced engineer.

An excessive annual expenditure for new belting and all excessive belt maintenance cost can be attributed directly to belting abuse caused by lack of knowledge of the subject and the failure of those in authority to realize that in purchasing belting they are not merely buying strips of material but are buying the transference of power from one point to another.

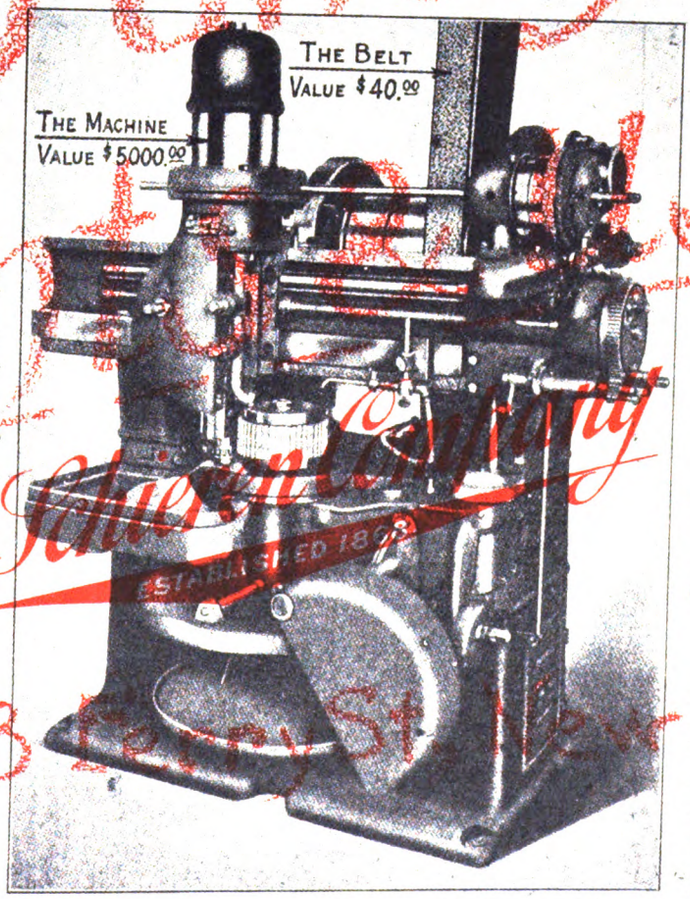
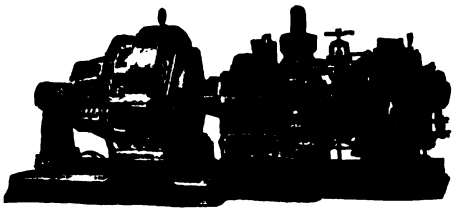


Fig. 3. This gear generator cost about five thousand dollars. Its output is dependent upon a forty-dollar belt. Belts are a governing factor in machine output.

The purchasing divisions of corporations should not prescribe the types, brands and sizes of belting to be used. This is the function of the mechanical section because Purchasing Agents have not the time to investigate the actual plant conditions under which the belting is called upon to operate; therefore price is the absorbing factor and the type or brand of belting purchased is a matter of discount. First cost is nothing when compared with the advantages to be gained by buying the correct type for the installation as the conditions and the peak load tell the story.

The mechanical division should determine the types and grades of belting best suited for their various installations, and an experienced engineer of this division should specify the widths and thicknesses of these types and grades for each individual drive, but in the majority of cases the

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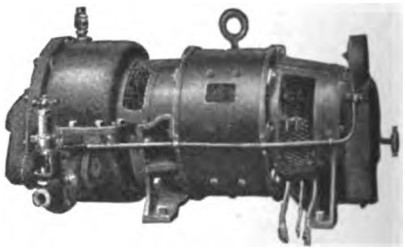
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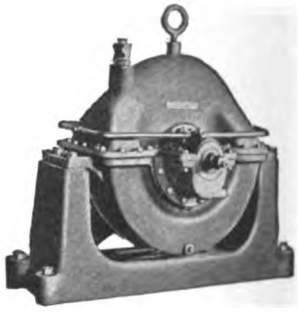
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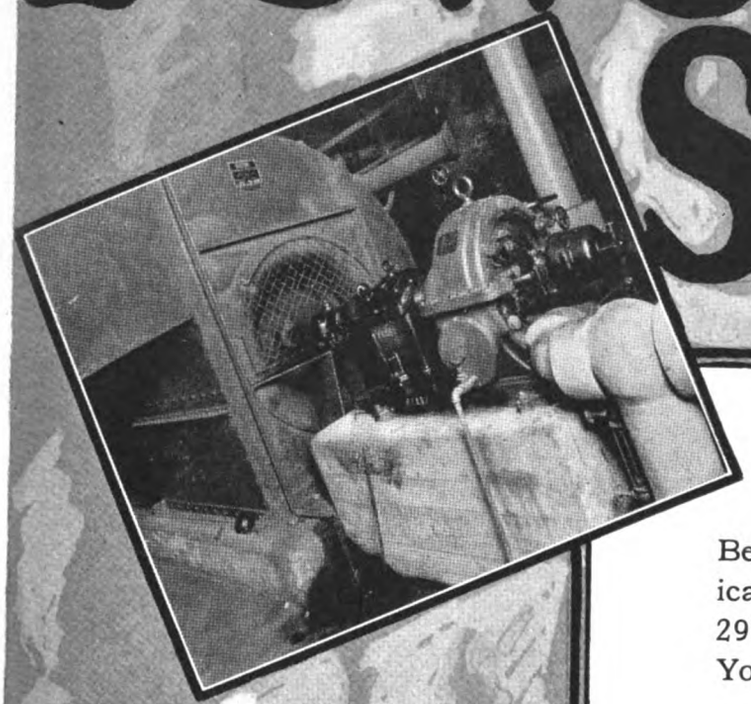
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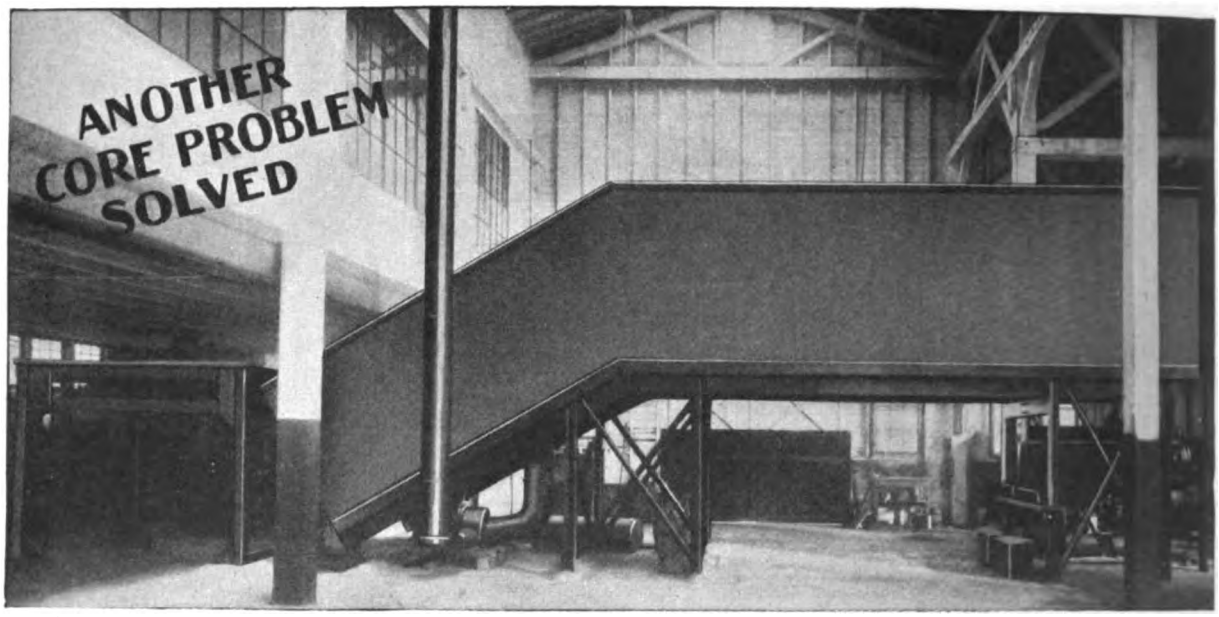
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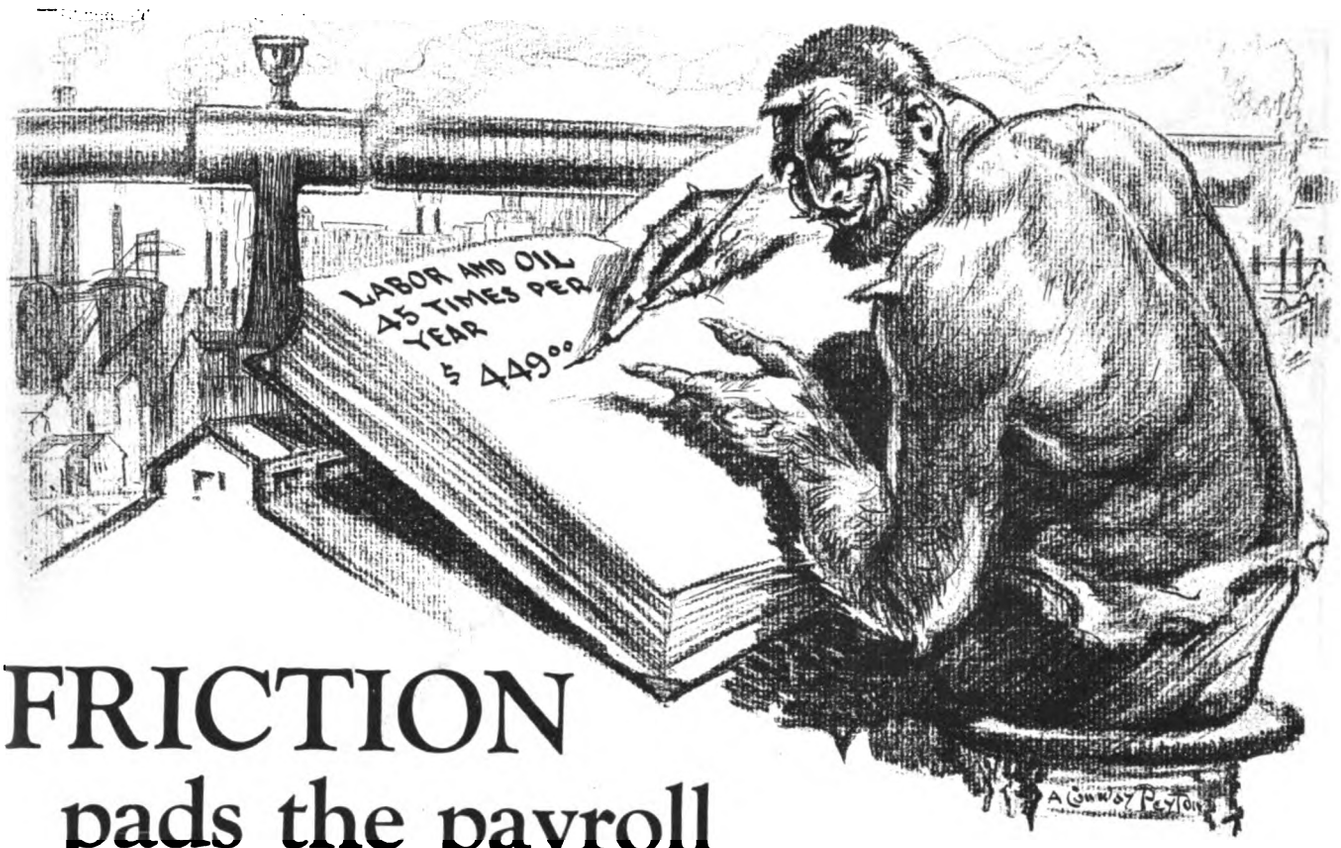


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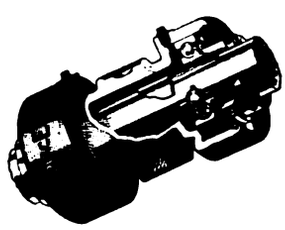
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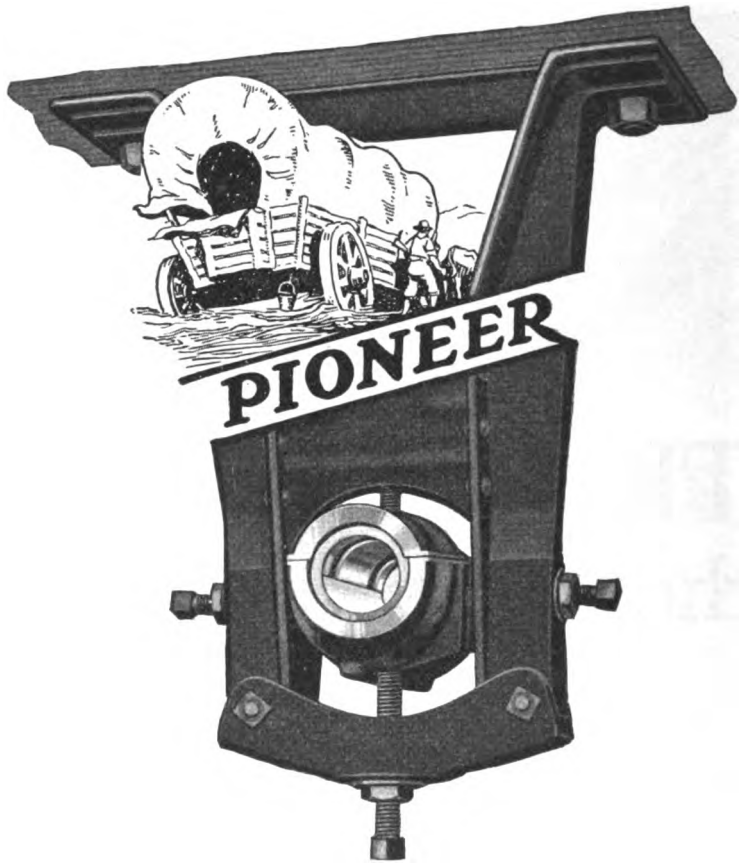
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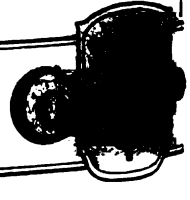
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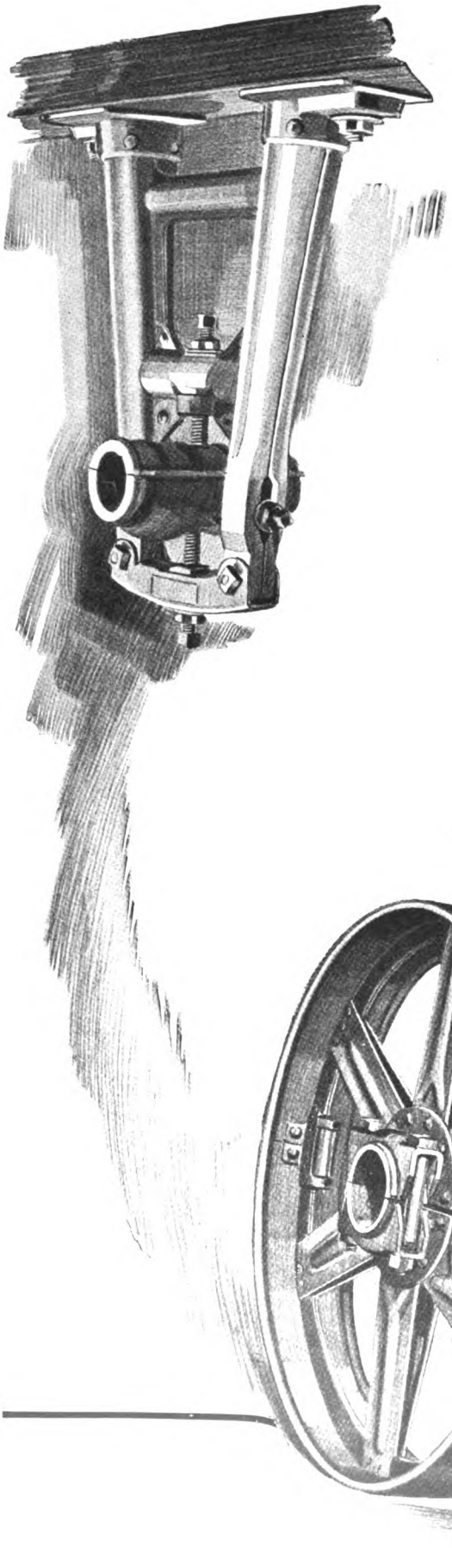
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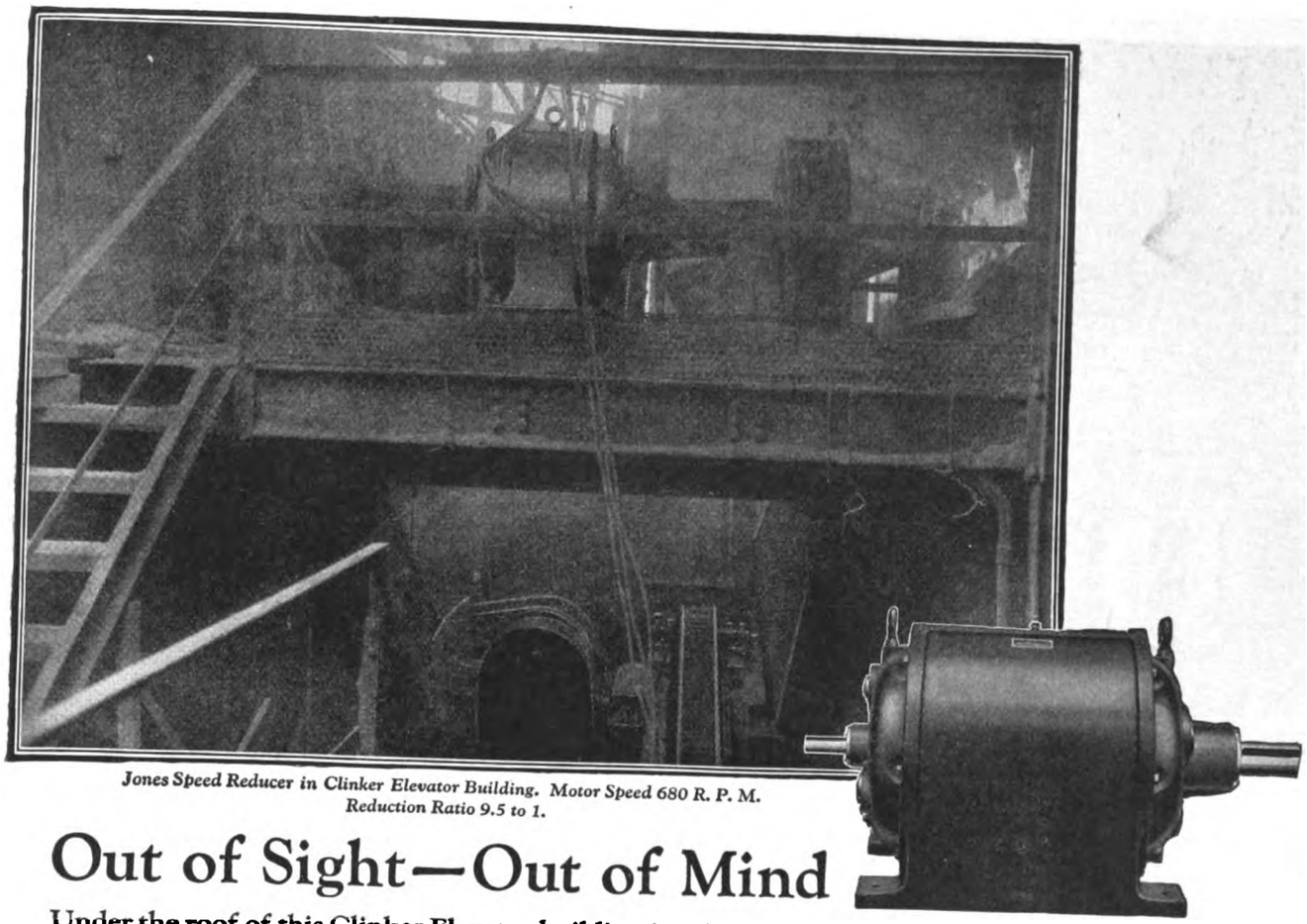
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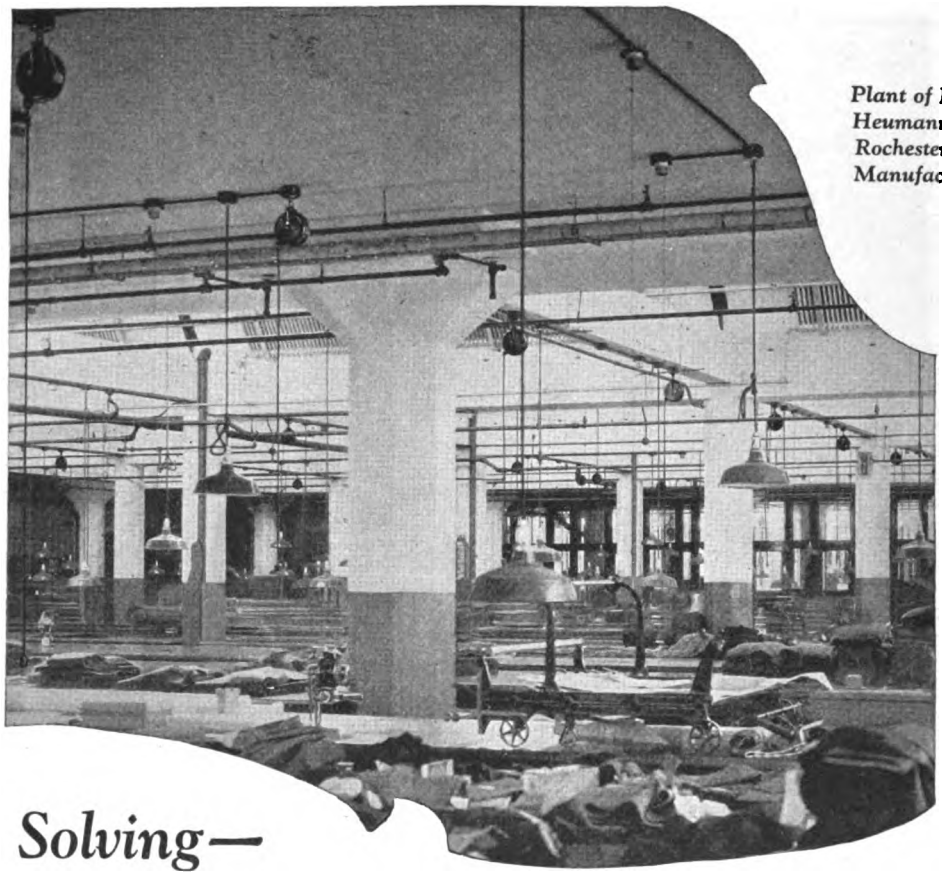
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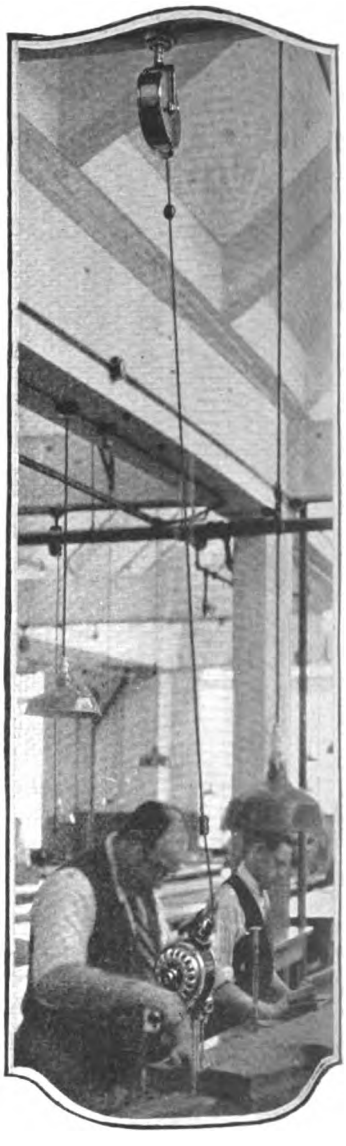
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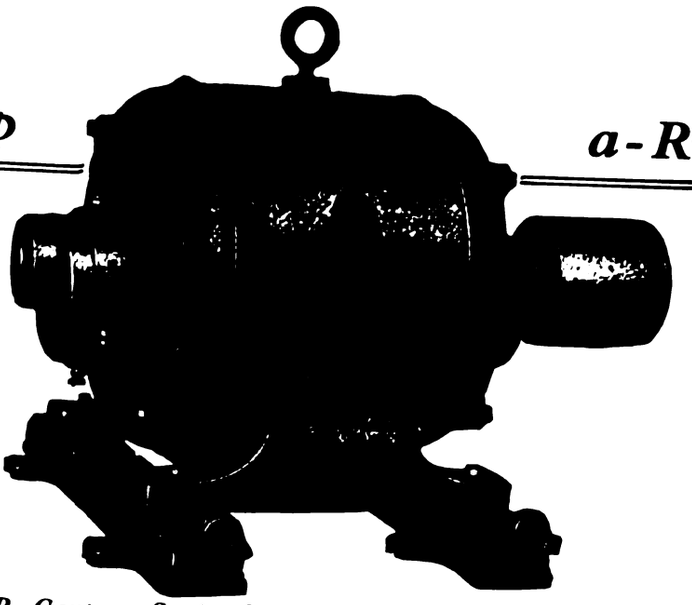


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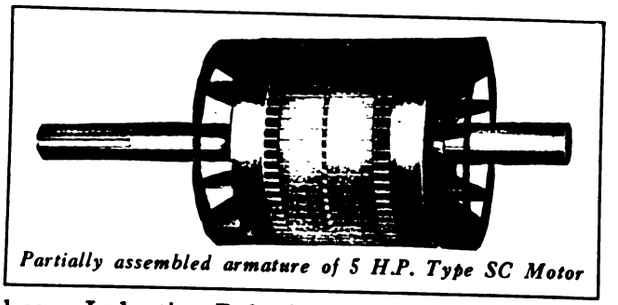
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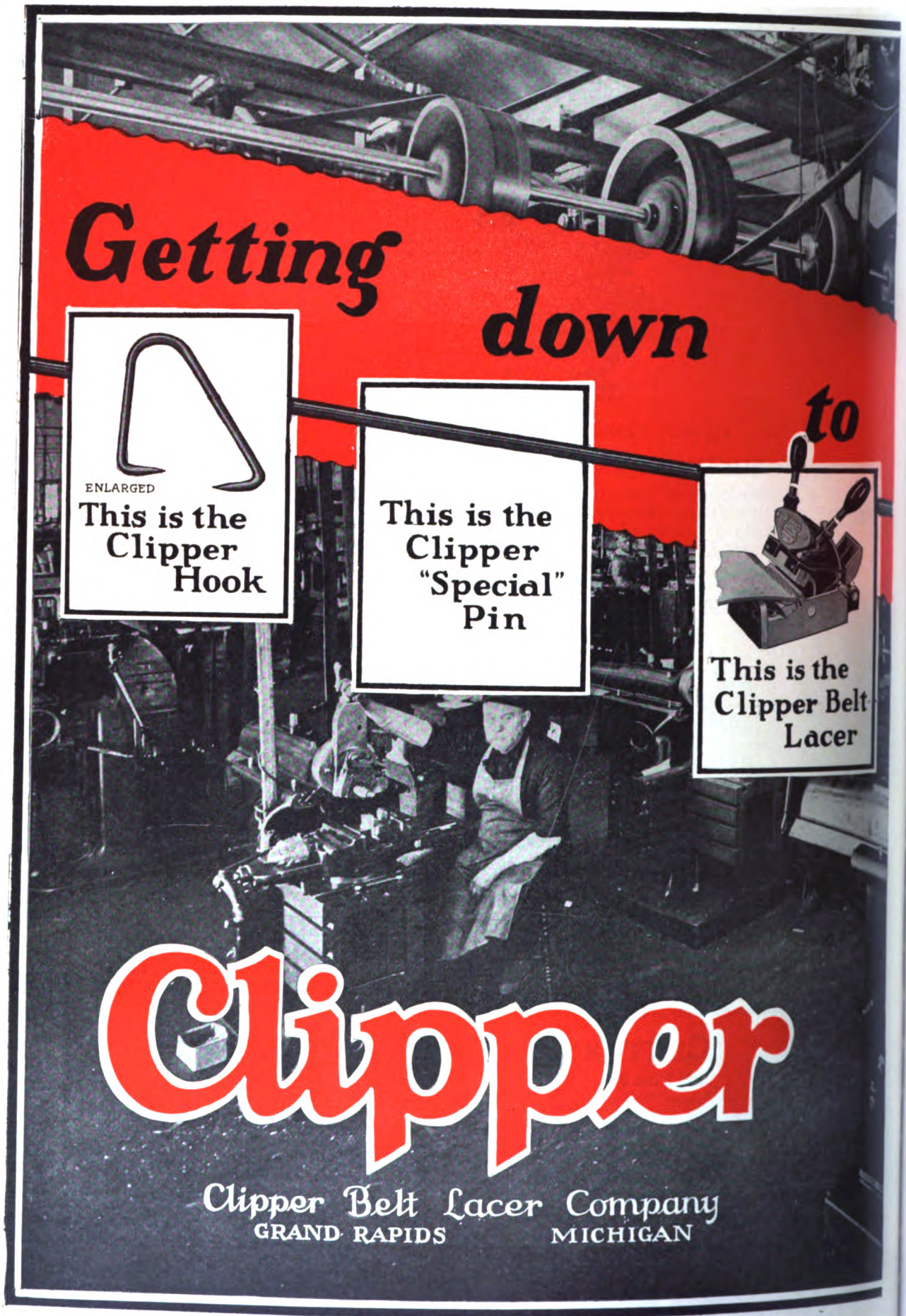
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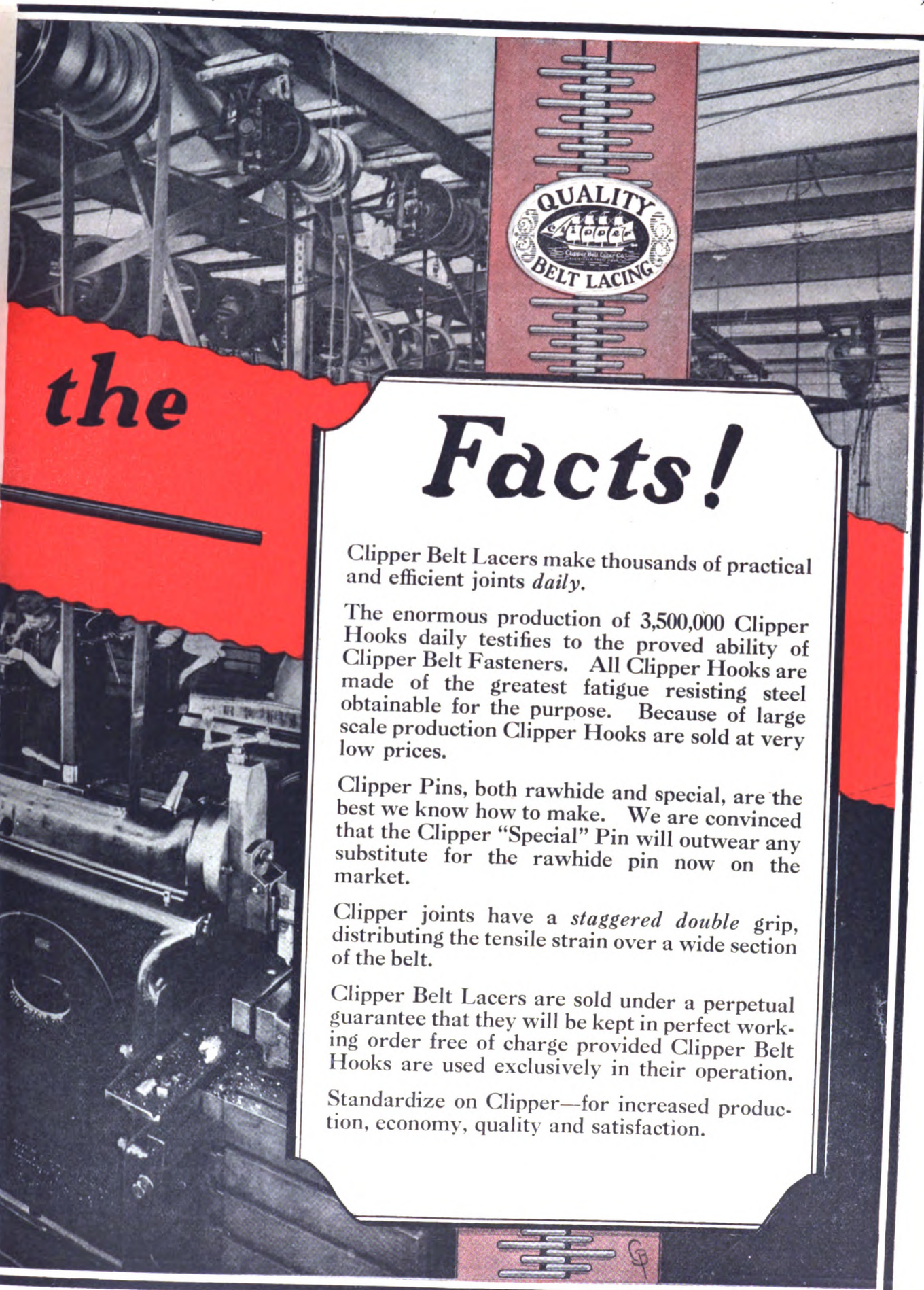
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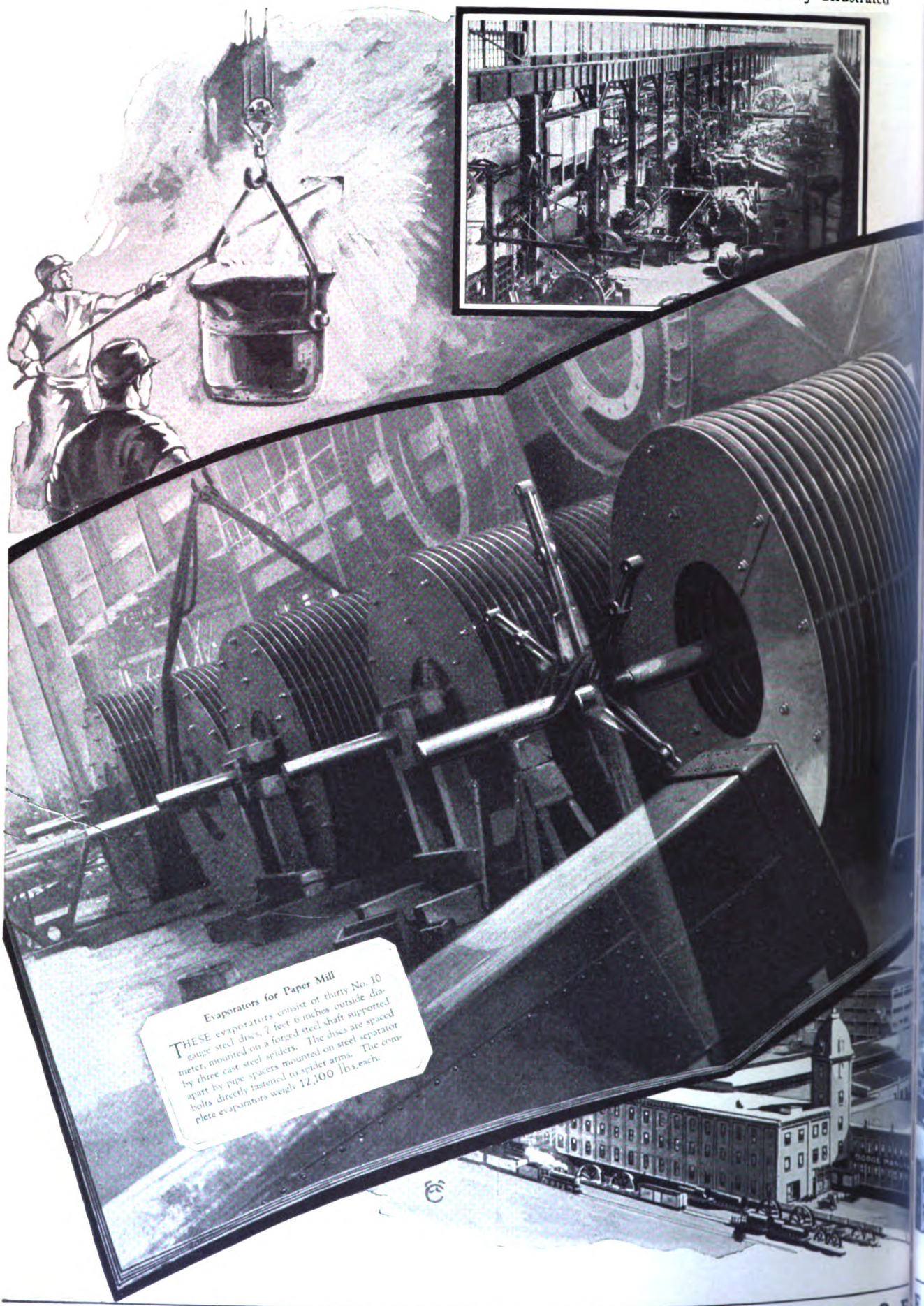
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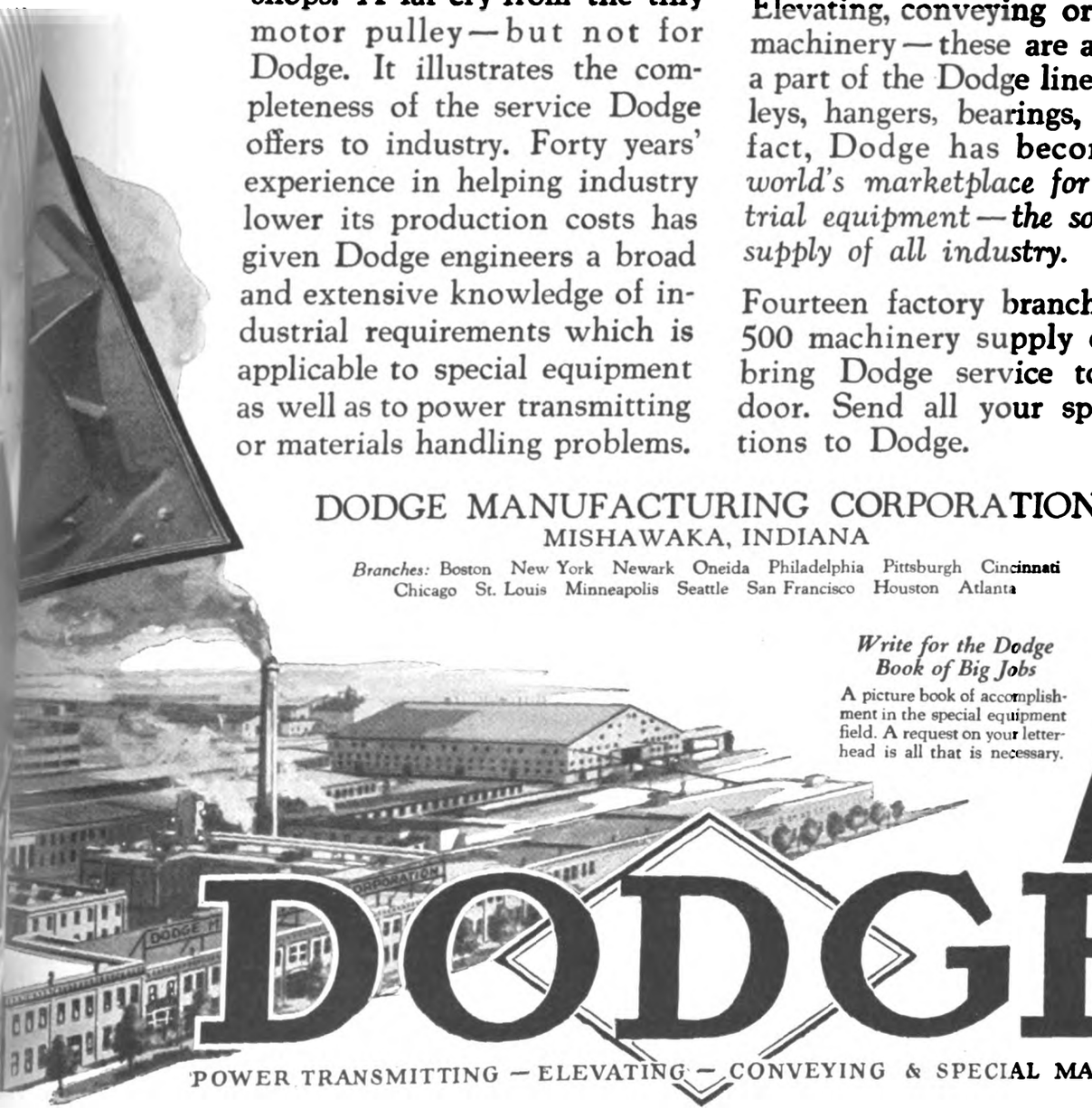
The extent of its foundry and machine shop facilities enables Dodge to meet the demand for pounds or tons.

Elevating, conveying or special machinery—these are as much a part of the Dodge line as pulleys, hangers, bearings, etc. In fact, Dodge has become the *world's marketplace for industrial equipment—the source of supply of all industry.*

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(TRADE MARK REG.)

Wherever belts are used to transmit power from one pulley to another the Lenix will improve the operating conditions. Thousands of Lenixes are in operation on installations ranging from 1 HP to 1400 HP. These drives are horizontal, vertical, and some are quarter turn.

The Lenix is not an idler. It is a "belt wrapper" scientifically applied to belt drives for the purpose of saving floor space, eliminating belt slippage and improving the general capacity of the drive.

At the Power Show, Grand Central Palace, New York, Nov. 30th to Dec. 5th, there will be a visual demonstration by the stroboscopic method of the power lost through belt slippage.

This demonstration will be made with belt drives operating under conditions as nearly alike as it is humanly possible to make them. Visitors are cordially invited to Booth 281 to witness this demonstration.

Booklet "Saving Slippage & Space" will be mailed on request to those unable to attend the show.

5 Points

1—The LENIX increases the arc of contact between belt and pulley.

2—The LENIX maintains constantly and accurately the proper tension in the slack side of the belt.

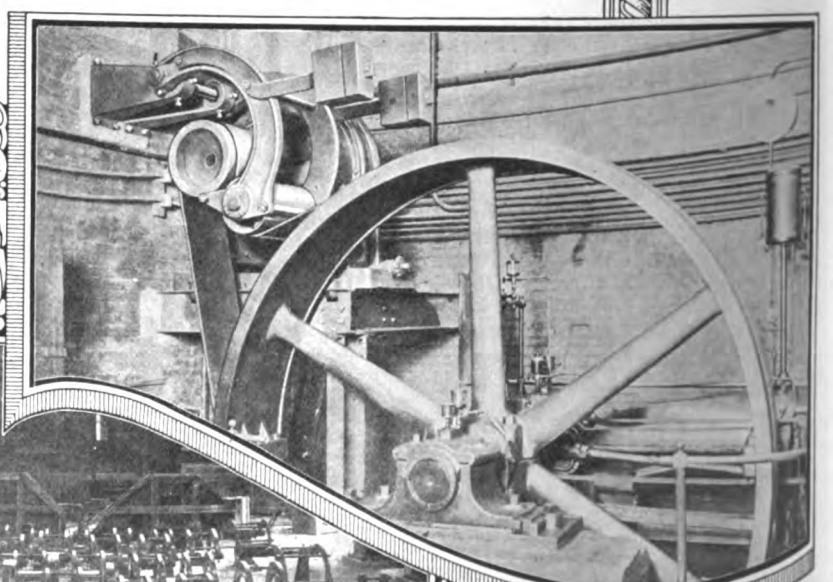
3—The LENIX saves floor space, building space and belting because of freedom in pulley locations.

4—The LENIX saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The LENIX permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

F. L. Smidth & Company, Engineers
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Engine driven Alternator with Lenix



90 LENIXES on *one* *order* to *one* company

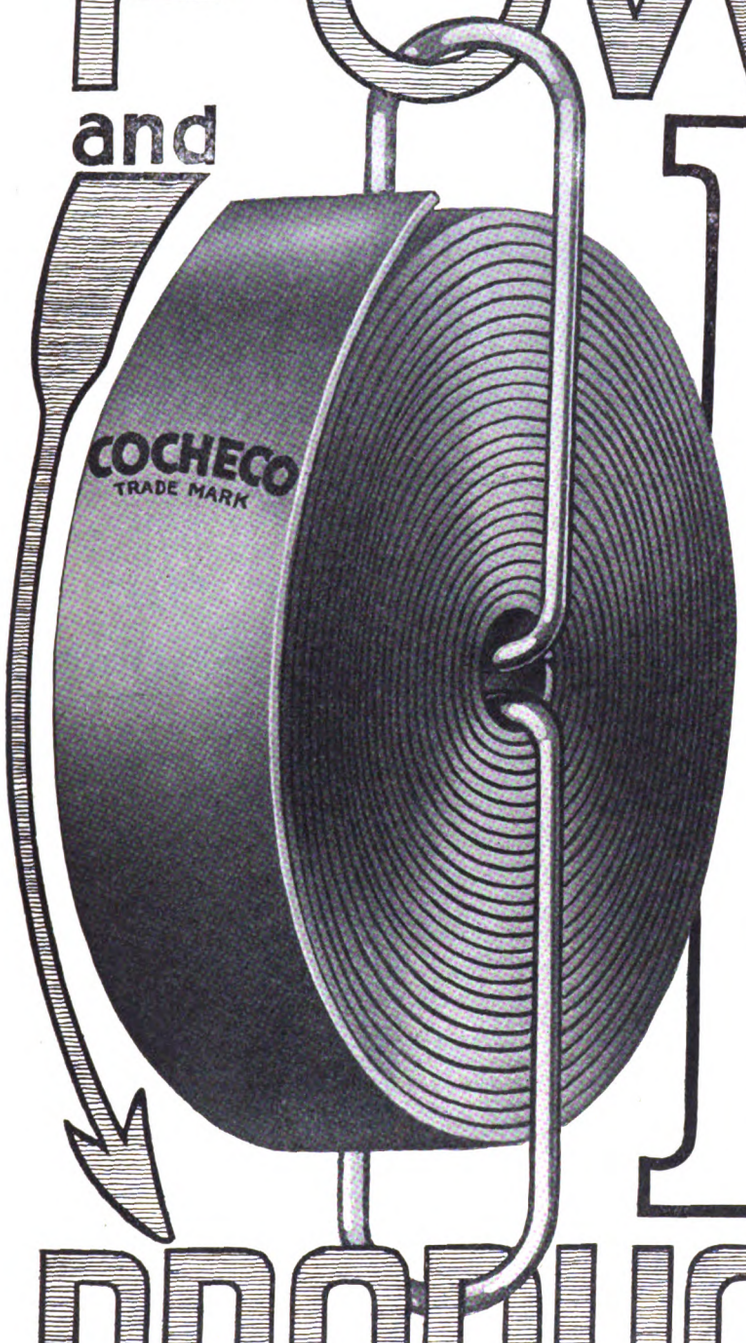


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a Dependable Link between

POWER and PRODUCTION



OF what avail is it to equip your plant with the best machines that money can buy and then link them up to your power plant with belting bought on a low price instead of a quality basis?

Experience has proven that such a policy is the harbinger of costly transmission troubles and broken production schedules.

It pays in the end to use the best belting procurable and we unhesitatingly say that Cocheco is chief in the belting field.

We simply put into Cocheco the very best of stock and workmanship and sell it at the lowest possible price.

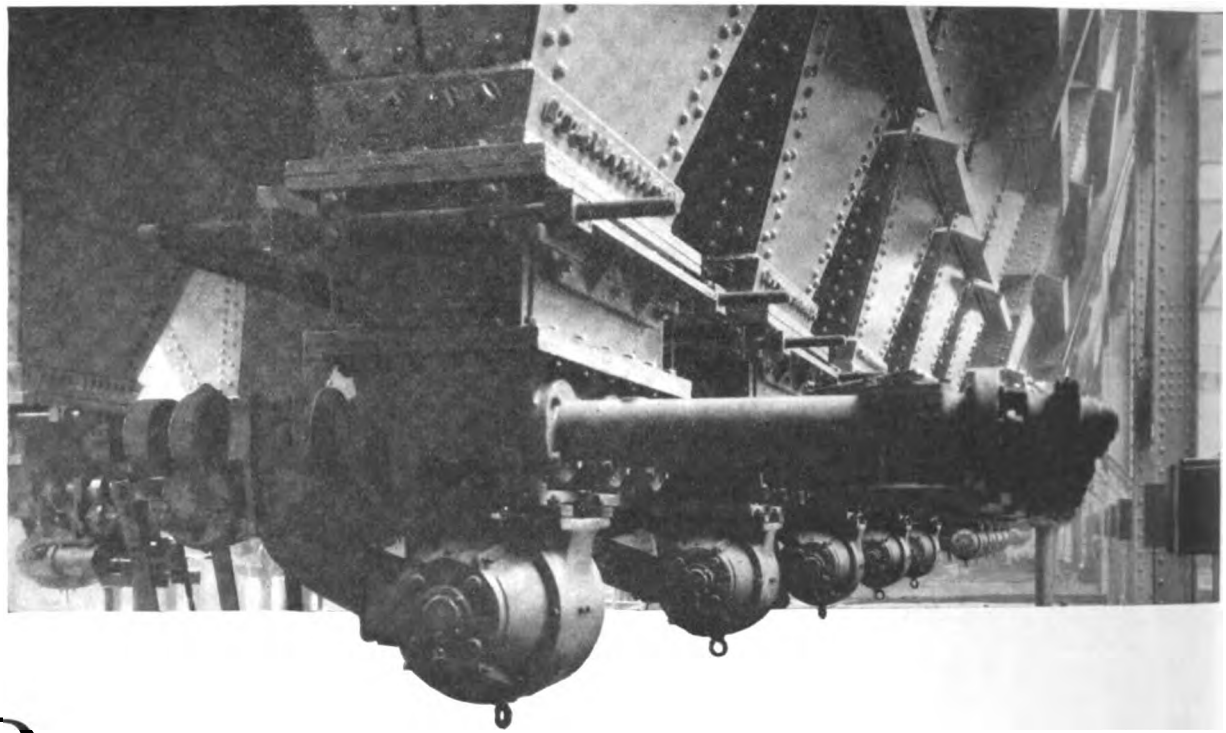
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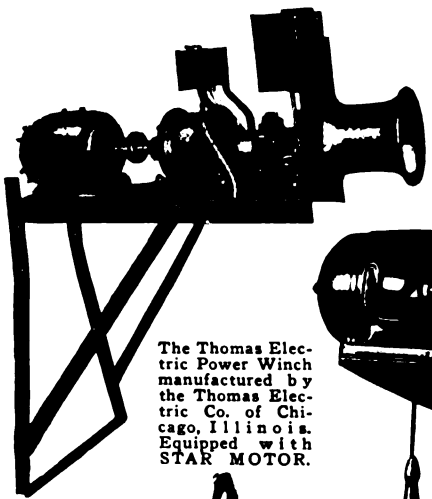
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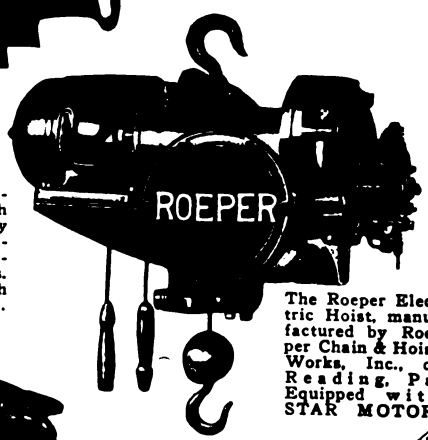
STAR-MOTORS



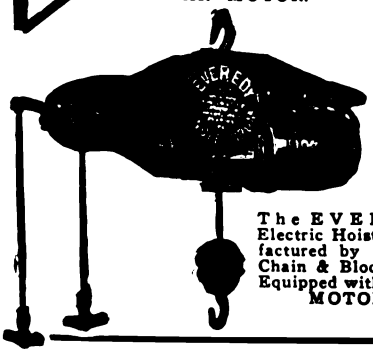
Dependable Motive Power for the Fuel Saving of This Giant Power Station



The Thomas Electric Power Winch manufactured by the Thomas Electric Co. of Chicago, Illinois. Equipped with STAR MOTOR.



The Roeper Electric Hoist, manufactured by Roeper Chain & Hoist Works, Inc., of Reading, Pa. Equipped with STAR MOTOR.



The EVEREDY Electric Hoist, manufactured by Reading Chain & Block Corp. Equipped with STAR MOTOR.

Here is a row of 53 Fuller-Lehigh Pulverized Coal Feeders in the new Miami Fort Power Station of the Columbia Gas and Electric Company, Cincinnati, Ohio, equipped with STAR MOTORS. This is one of America's latest super power stations built for greater production of electric power at lower unit cost per K. W. The row of rugged 2 H. P. motors were specified by Fuller-Lehigh to be STAR MOTORS. To be chosen for this gruelling service is as high a commendation as STAR MOTORS could expect to receive from any equipment manufacturer. Particularly in view of the fact that a central station is very discriminating in choosing electrical equipment of any kind.

STAR BALL BEARING MOTORS give the assurance of steady, dependable low cost power, with maintenance cut down to the minimum.

You will find STAR MOTORS used as standard equipment on many well known products throughout industry—on power equipment, materials handling and other machinery.

STAR MOTORS are manufactured for all commercial purposes, both in A. C. and D. C.—in sizes from ¼ to 75 H.P. inclusive, horizontal or vertical shaft construction.

STAR ELECTRIC

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a guarantee that protects any equipment manufacturer's products

What the equipment manufacturer needs in a motor is one that is so rugged and gives such economical and dependable service that no one ever thinks of the motor. They only know the equipment by the name—such as Fuller-Lehigh Pulverizers, Roeper Hoists, Everedy Hoists, etc.—and recognize the worth of the equipment because of its dependable service, a large part of which is supplied by its STAR MOTOR.

STAR MOTORS are giving just this kind of service to many equipment manufacturers who want their products to stand out as leaders in their line.

Our Engineering Department is ready to aid you in the selection of a STAR MOTOR best suited to your particular requirements or one can be designed or altered to suit any special needs of the manufacturer.

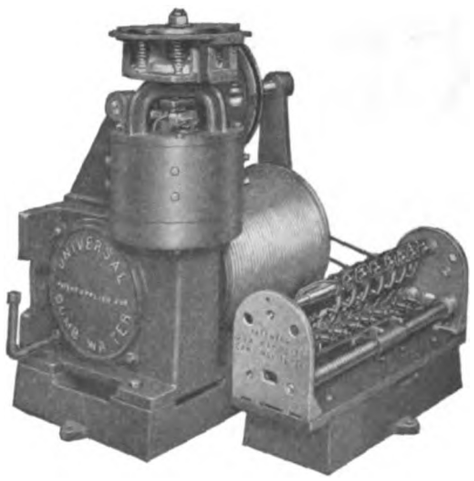
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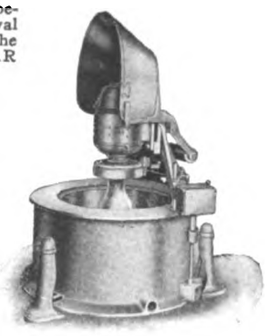
Universal Electric Dumb Waiter with winding drum type with floor selector —manufactured by George T. McLauthlin & Company, Boston, Massachusetts, and equipped with STAR MOTORS.



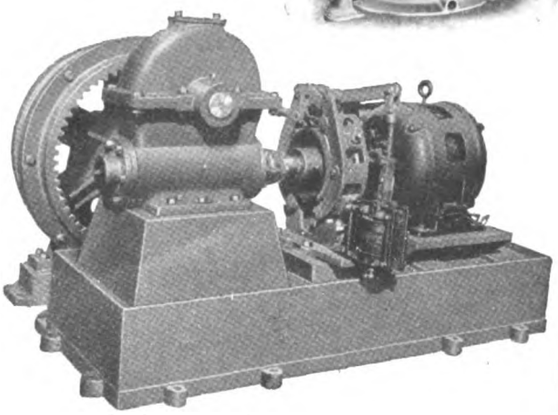
STAR MOTOR Driven two speed 60" centrifugal extractor used for pin weighting. Manufactured by King & Gerber, Paterson, New Jersey.



Allen & Billmyre 10 H.P. Portable Blower and Exhauster especially designed for the removal and collection of dust in the New York Subways. STAR MOTOR used.



A 48" Hercules Ball Bearing Equipped Electric Hydro Extractor using STAR MOTOR. Made by the Haring & Stephens Company, Paterson, New Jersey.



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THE PROPER TYPE FOR EACH REQUIREMENT—

Material handling requirements are so varied that it is impossible for one type of machine to handle all work with the greatest efficiency. The Portable Machinery Company has therefore developed a complete line of conveyors and can offer the best machine for each requirement.

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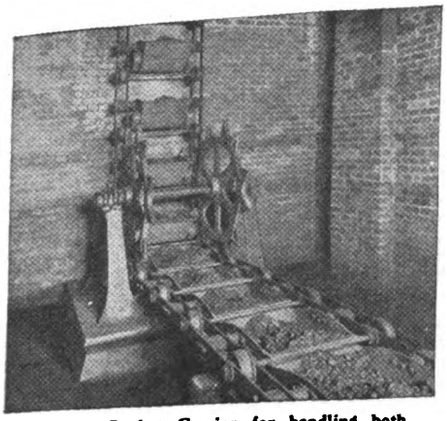
In your territory is permanently located one of our experienced Sales and Service Engineers who has studied thousands of handling problems. He will gladly call on you personally to discuss any phase of this field.

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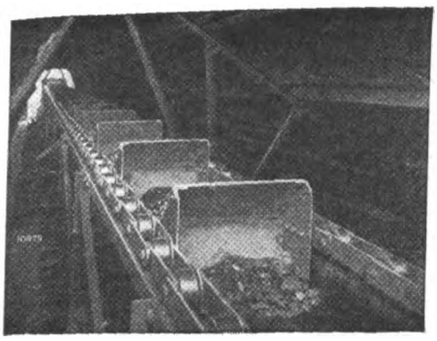
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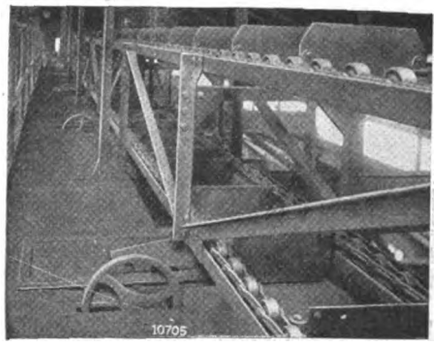
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Pivoted Bucket Carrier for handling both coal and ashes



V-Bucket Combination Elevator and Scraper Conveyor



Scraper Conveyors—Built in single and double strand types

What Price Does Industry Pay for Its Coal Supply?

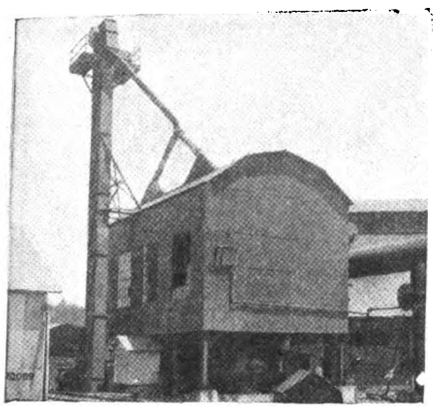
THE true price is not the cost at the mine, nor delivered on the siding—but is the price delivered at the furnace door.

The conveying system which brings the coal from the cars to stokers—that carries the ashes from under boilers to bin or railroad car must be fitted to the responsibility which it bears.

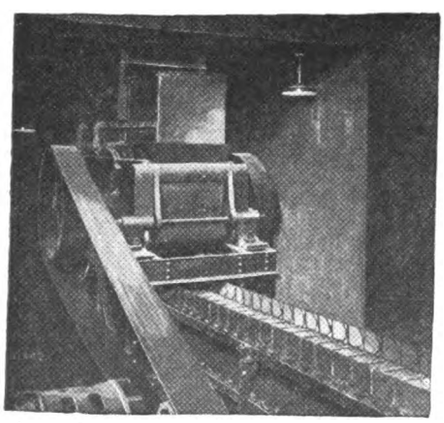
It is out of a full knowledge of hundreds of installations extending over a period of nearly 50 years, involving all kinds of coal and ashes handling conditions, that Jeffrey designs are made.

A wide variety of standard types and sizes representing unusual flexibility, adaptable to all sizes and kinds of plants.

If, however, your local conditions necessitate a special design—Jeffrey Engineers are qualified by experience to handle the problem for you. Write for catalog No. 385K.



Bucket Elevator delivering to several storage points by means of spout



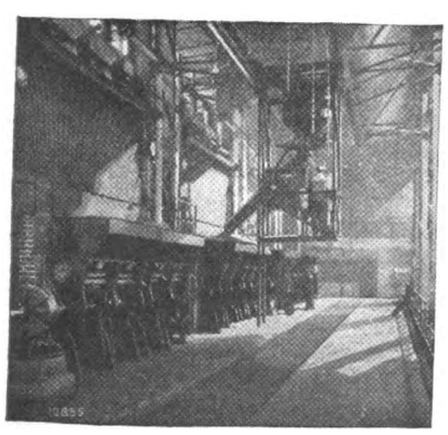
Apron Conveyor receives coal from Track Hopper, Plate Feeder and Single Roll Crusher

The Jeffrey Manufacturing Company

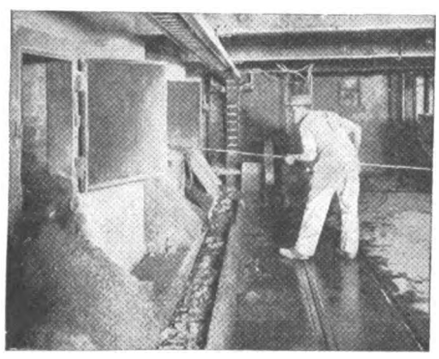
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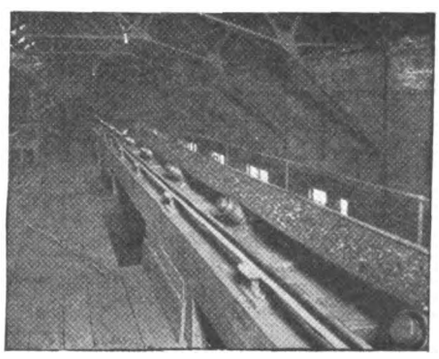
JEFFREY
MATERIAL HANDLING EQUIPMENT



Traveling Weigh Larries furnished in motor or hand-propelled types



Reliance Drag Chain Ashes Conveyor



Belt Conveyors—especially adapted for distributing coal over long storage spaces

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There's Chance for Losses in Weighing Coal

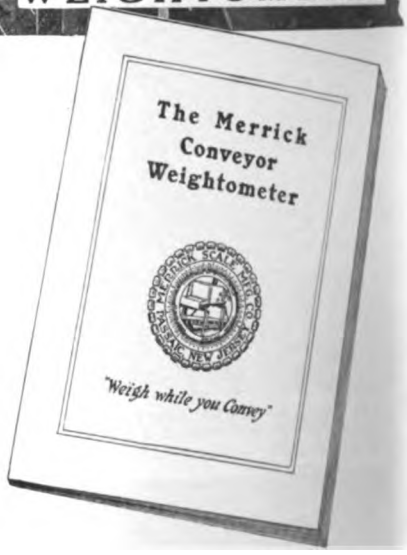
Stop it with a WEIGHTOMETER

Your coal costs you too much to guess or depend on bill of lading weights.

If your coal, coke or other fuel is conveyor handled a Merrick Scale will give you a 99% accurate check. The illustration above shows one Merrick Weightometer which handles 300,000 tons of coal yearly and this plant can check the weights to within 1%.

A Merrick Weightometer can also be used on other coinveyor handled materials—ore, sand, stone, gravel, finished cement, etc., and it records the weights while the materials move along. It does this automatically.

Costs are high and guess work helps to make **them higher. You need a Merrick Weightometer if you handle coal and other materials over a conveyor.**



See our exhibit Booth No. 237-40 at the Power Show

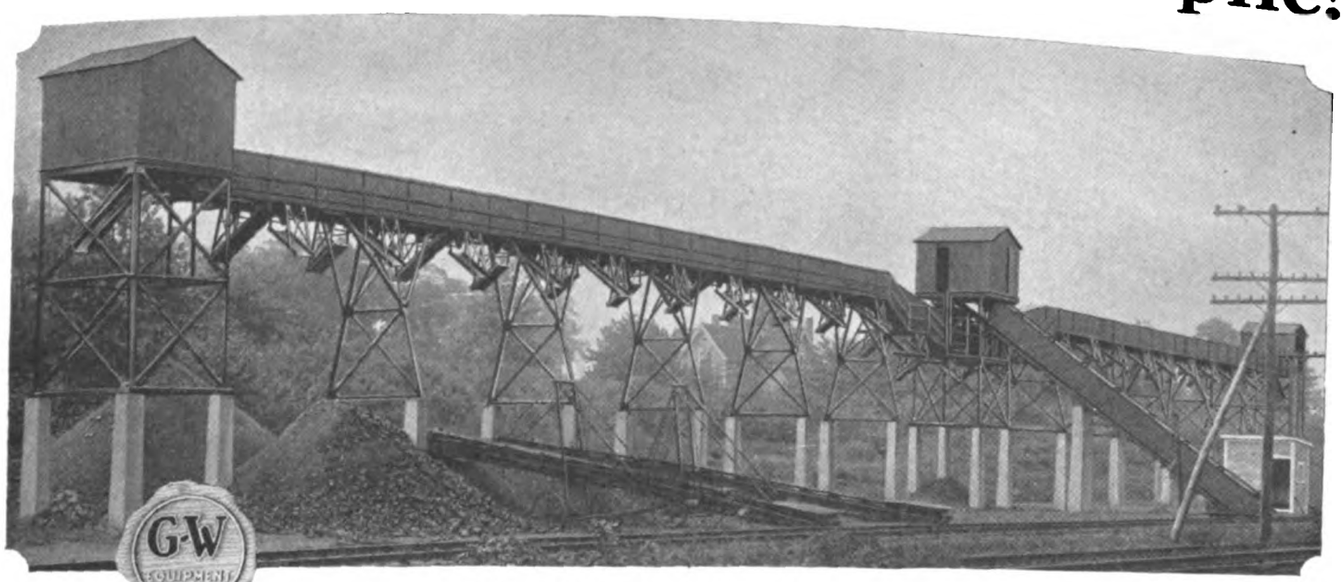
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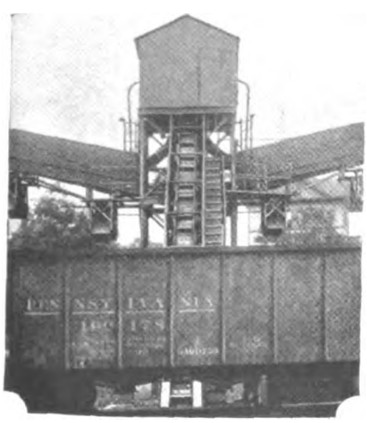
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Economy starts at the coal pile!



Gifford-Wood Ground Storage Coal Handling Equipment at plant of International Silver Co., Meriden, Conn.





At the International Silver Company

Thanks to the enterprise and efficient production methods of The International Silver Company, Meriden, Conn., fine silverware has been brought within the means of almost every one.

Even in the very first step of manufacture—production of steam—utmost efficiency prevails. **Economy starts at the coal pile!**

To save time and labor in receiving and storing coal, all incoming coal is handled by the Gifford-Wood Elevating and Conveying Equipment shown above. Only two men are required.

Coal is received in bottom-dump cars and is discharged into a track hopper. It is then automatically elevated, conveyed horizontally, and discharged to ground storage.

The Gifford-Wood Co. has had years of experience in designing and building coal and ash handling equipment to meet diversified needs. **By getting in touch with the nearest office below you can tap this reservoir of valuable experience and obtain immediate co-operation on any coal or ash handling problem with which you may be confronted.**

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Main Office: 29 Hill Street, Hudson, N. Y.

New York: 50 Church St.
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Gifford-Wood

BUILT STRONGER LASTS LONGER

COAL HANDLING EQUIPMENT

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"SCRAP YOUR CRANE if

it is causing costly delays in production—if the bother and expense of operating, maintaining and repairing is excessive."

That's the substance of the remark made by an industrial executive when he planned replacing a low first cost but expensive crane with a P & H.

Buy Crane Service

THERE is only one reason for a crane—*service*. P & H Crane service is low cost handling service because the crane is *right* in the first place.

P & H does more than meet specifications. Instead of working down to them, P & H works up from them.

Metallurgists test all metals; steel plates purchased as flat plates are nevertheless re-rolled to give absolute insurance against the slightest strains; every type of modern machine tool is employed—all supervised by executives who have for 41 years insisted on precise workmanship.

That this has been appreciated is evidenced by the 8,000 P & H Traveling Cranes and Hoists that have gone into service.

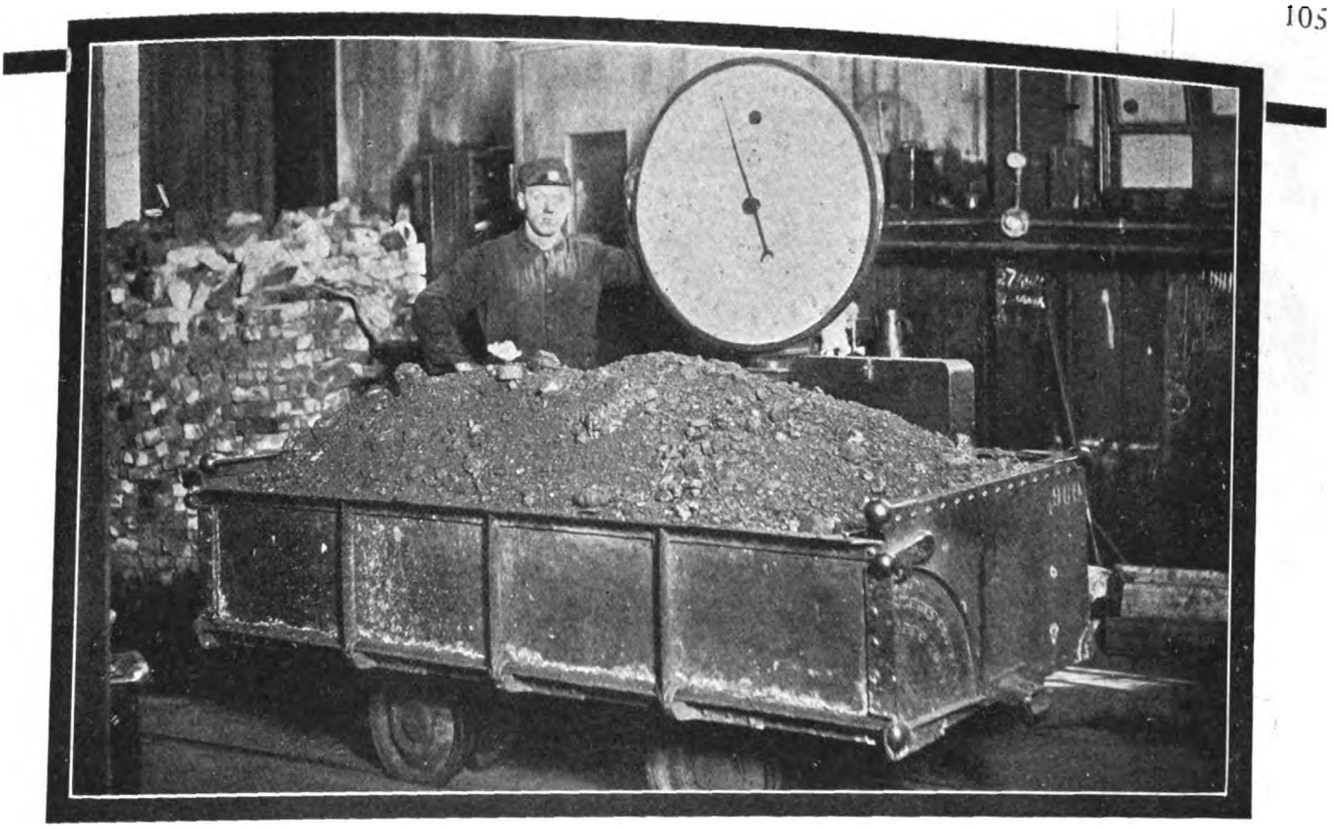
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Accurate Weighing Is the First Function of Power Economy

An absolute check on every ton of coal used day by day is a positive measure.

With a Kron Scale, not only is every ton of fuel weighed with absolute precision, but there is the added advantage of the "Load and Look" principle—*no delay in weighing.*

Then the fact that the Kron Scale is all metal and practically dustproof, assures its reliability and long life in places like boiler rooms and other dust and damp laden rooms.

Our illustrated catalog shows examples of the many uses of Kron Scales in hundreds of industries. Write for a copy.

Write for "Load and Look"
the title of a book that shows the solution to many weighing problems. It contains examples in every line of business.

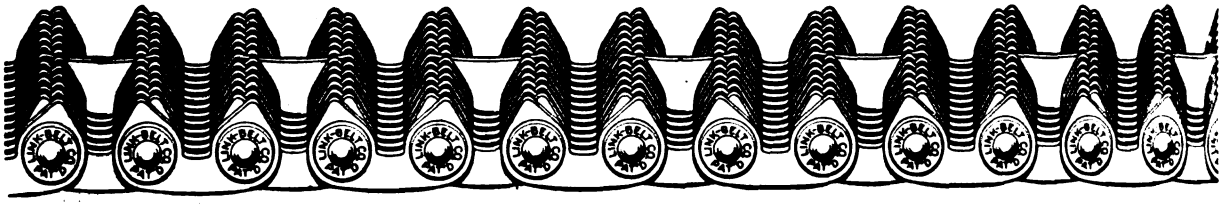
KRON SCALES

The American Kron Scale Co.

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Now—Link-Belt



No Delay —No Waiting

Ordering is a simple matter.

In Link-Belt Stock Drive Book No. 725 you'll find all the information needed — simple, straight-forward, and quickly gained.

May we send you a copy? It's free and involves no obligation on your part.

Maybe you can use a Silent Chain Drive right now — on some new equipment, or to replace an old belt or gear drive, where a hook-up on shorter centers will save space, or where constant, positive power transmission may represent power saving or better product.

Order To-Day get it Tomorrow

From ½ to 10 h. p. in Speed Ratios From 1 to 1 Up to 7 to 1

LINK-BELT Silent Chain is the efficient drive for lineshafts and machinery of every character—in every line of industry. Its many advantages have been attested by satisfied users, over a period of more than twenty years.

Use Silent Chain Drives instead of leather and rubber belts—instead of gears.

Remember, they combine the flexibility of belts with the positive action of gears.

Use Link-Belt Silent Chain Drives wherever you want to transmit power without slip or loss. For lineshafts, machine tools, pumps, blowers and compressors; in fact, equipment of every kind.

On actual test, Link-Belt Silent Chain maintains an efficiency of 98.2 per cent. Practically a flexible gear, it cannot slip. Tension is on pulling side of chain only; hence journal friction is much less than with belt drive. It is not affected by atmospheric conditions, performing equally well in hot, cold or damp places. Little attention is needed other than periodic oiling.

Being compact and flexible, it saves space and operates over long or short centers—permitting convenient location of your driving unit.

In no other power transmission can you find all these ideal qualities.

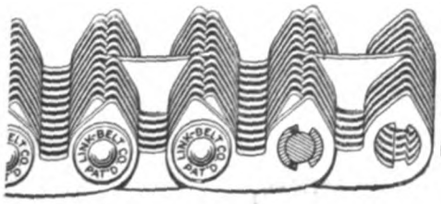
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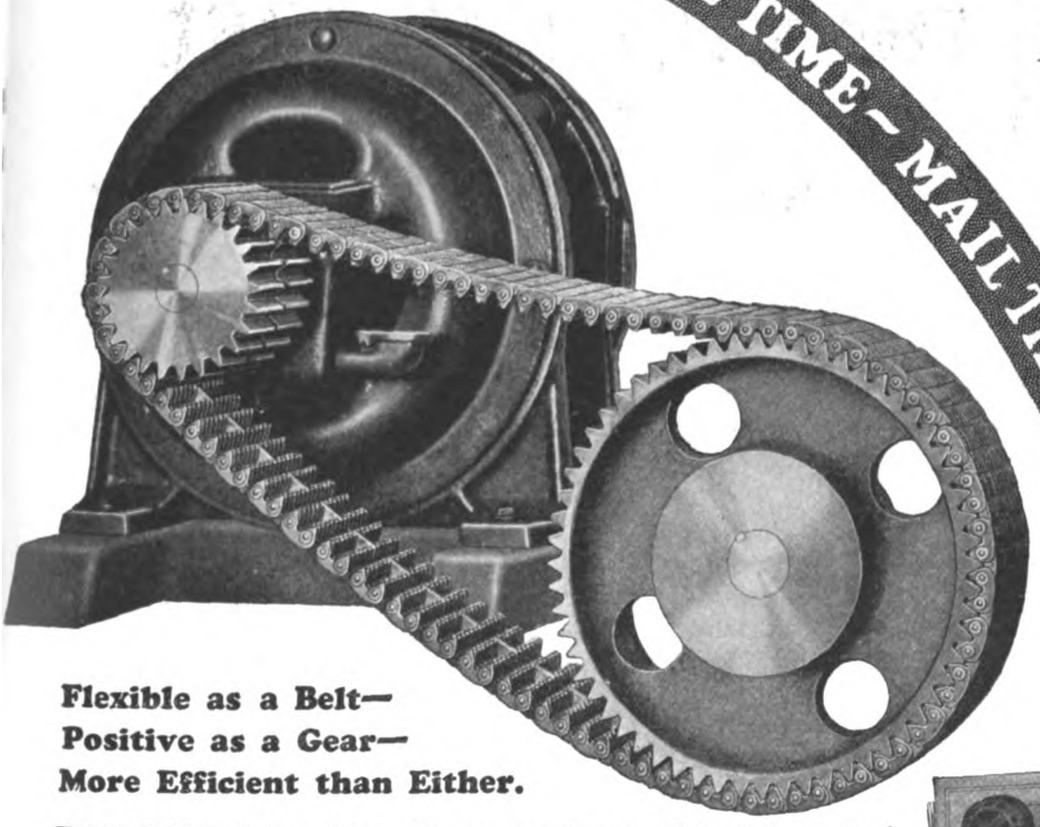
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Drives from Stock



SAVE TIME—MAIL THE COUPON

Carried by Your Nearest Distributor



Flexible as a Belt—
Positive as a Gear—
More Efficient than Either.

LINK-BELT Silent Chain Drives are 98.2% efficient (on actual test). They maintain this high efficiency throughout many years of trouble-free operation. The drive is positive, flexible, compact, durable, operates on short or long centers, and *performs equally well* in hot, cold, damp, dry or gritty places. When enclosed in Link-Belt oil-retaining dust-proof casing, it makes a most desirable "Safety First" installation.

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Leading manufacturers of Elevating, Conveying and Power Transmission Machinery

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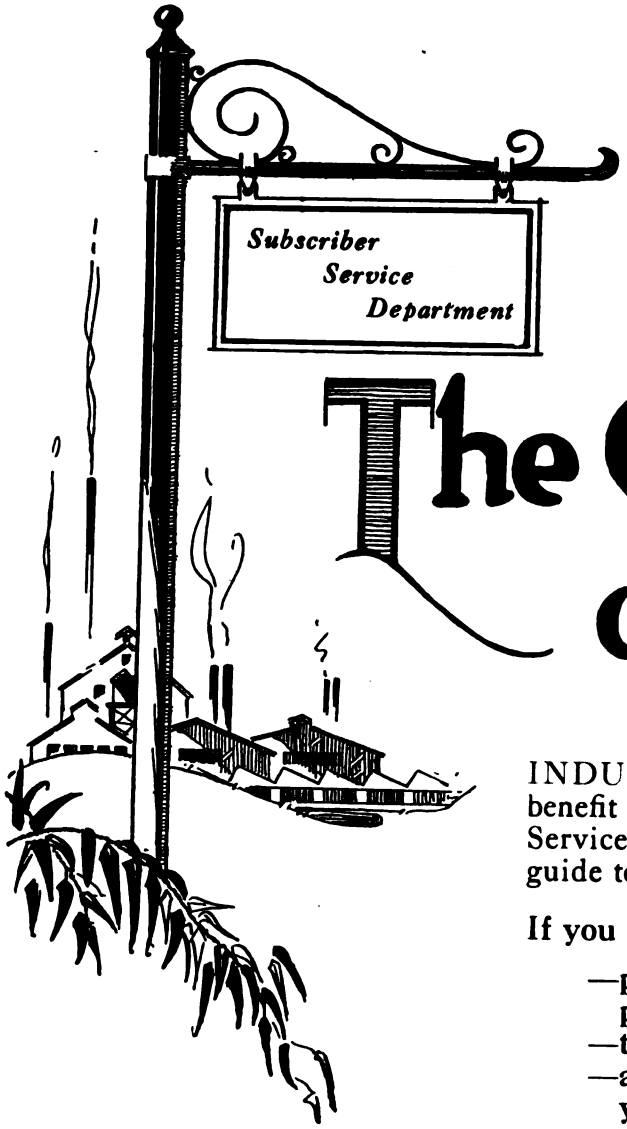
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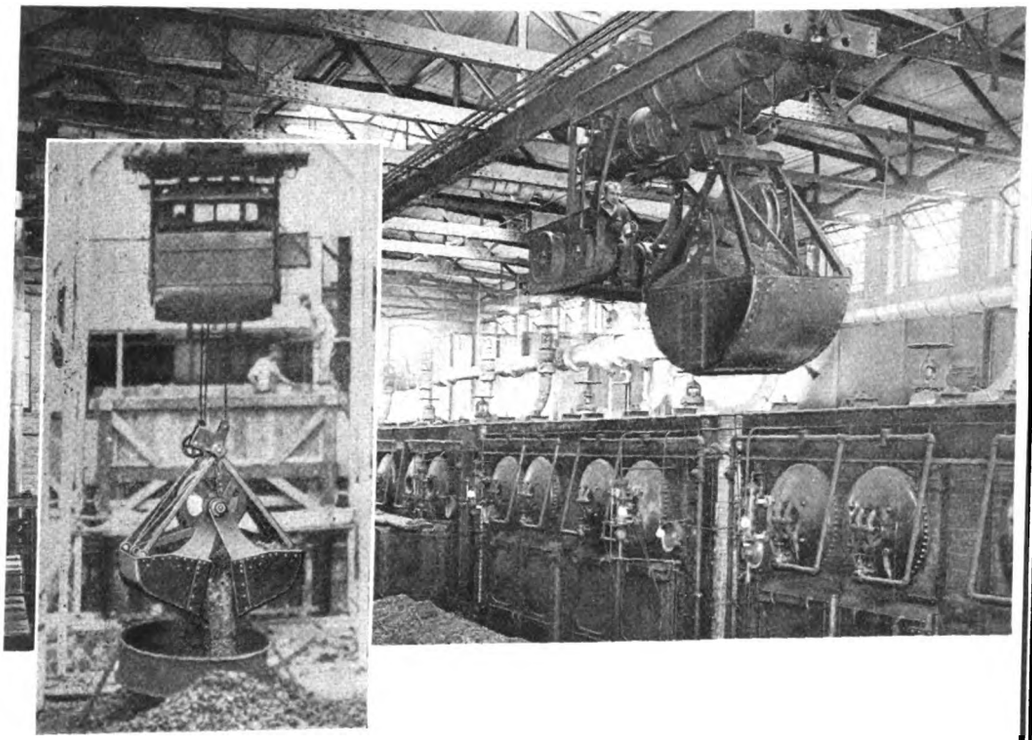
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Hayward Buckets



Overhead—out of the traffic

Two installations which emphasize the utility of Hayward Buckets — demonstrate the little headroom required for their operation and show how to avoid delays in getting coal to the boilers by placing the operating hoists overhead—out of the traffic.

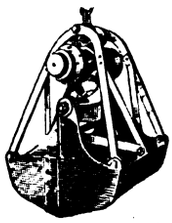
The use of Hayward Buckets cancels waste of space, time and labor by their adaptability to special service conditions of power plant operation.

Hayward Engineers can advise, without prejudice as to type or size, the correct bucket for your purpose. This is possible because the Hayward line stands alone in its completeness—including every type of grab bucket and many variations of each.

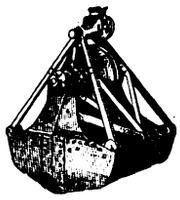
Get in touch with Hayward Engineers. Let them tell you how Haywards are serving power plants of every size in every industry. No cost or obligation for this service.

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Builders of Clam Shell, Orange Peel, Drag Line, and Electric Motor Buckets; Dredging; Excavating, and Coal Handling Machinery.



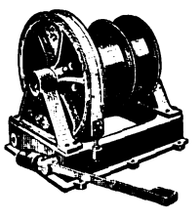
Electric Motor Buckets



Clam Shell Buckets



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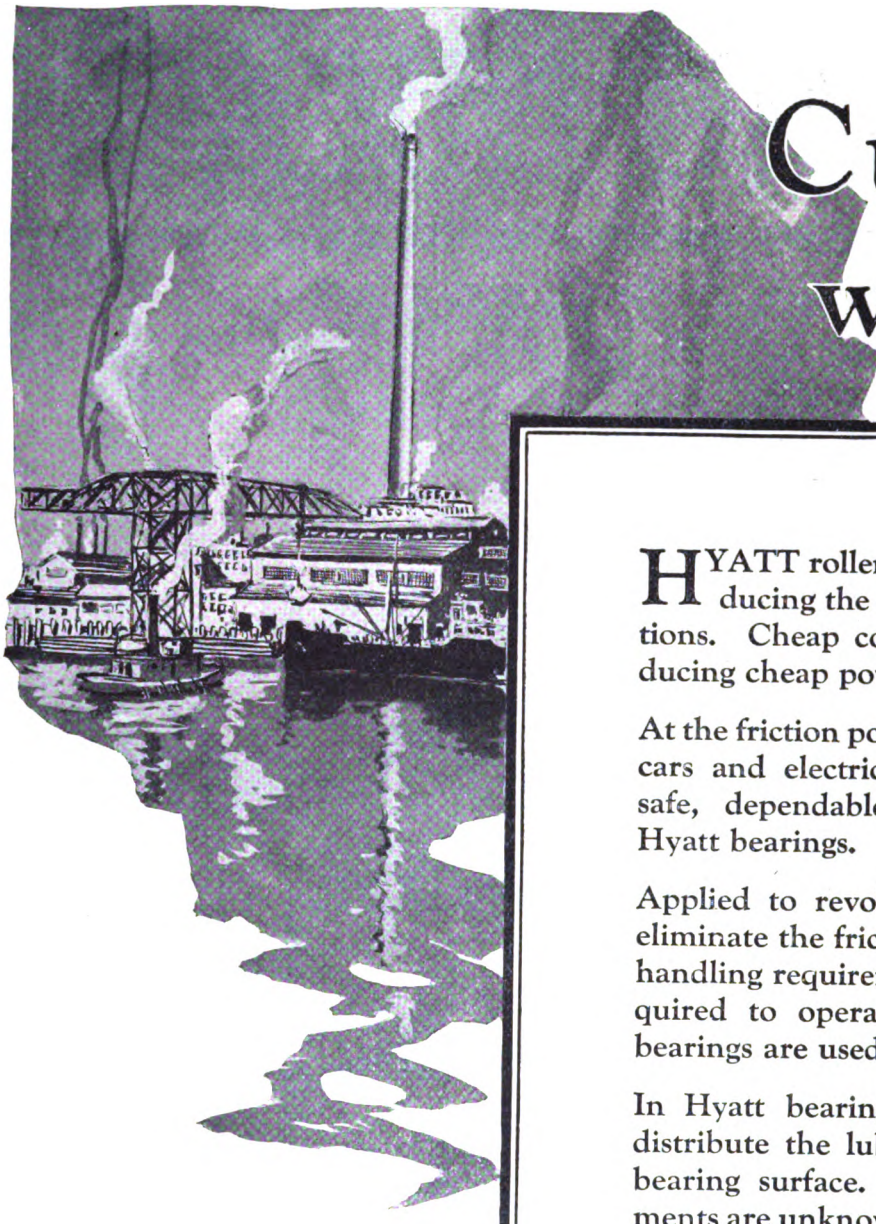


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Cut Coal with Hyatt

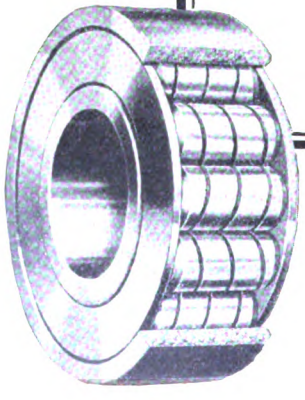
HYATT roller bearings aid materially in reducing the expense of coal handling operations. Cheap coal handling is a factor in producing cheap power.

At the friction points of conveyors, hoists, cranes, cars and electric motors, years of economical, safe, dependable operation are assured with Hyatt bearings.

Applied to revolving shafts and pulleys, they eliminate the friction factor and meet every coal handling requirement. Thus less power is required to operate equipment in which Hyatt bearings are used.

In Hyatt bearings the helically wound rollers distribute the lubricant evenly over the entire bearing surface. That is why bearing replacements are unknown to operators of coal handling machinery in which Hyatt roller bearings are used.

Hyatt roller bearings, due to the distinctive



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Handling Costs
Roller Bearings

design of their installation, keep the lubricant in and the dust out. This Hyatt feature has saved thousands of dollars in bearing maintenance for users of material handling equipment.

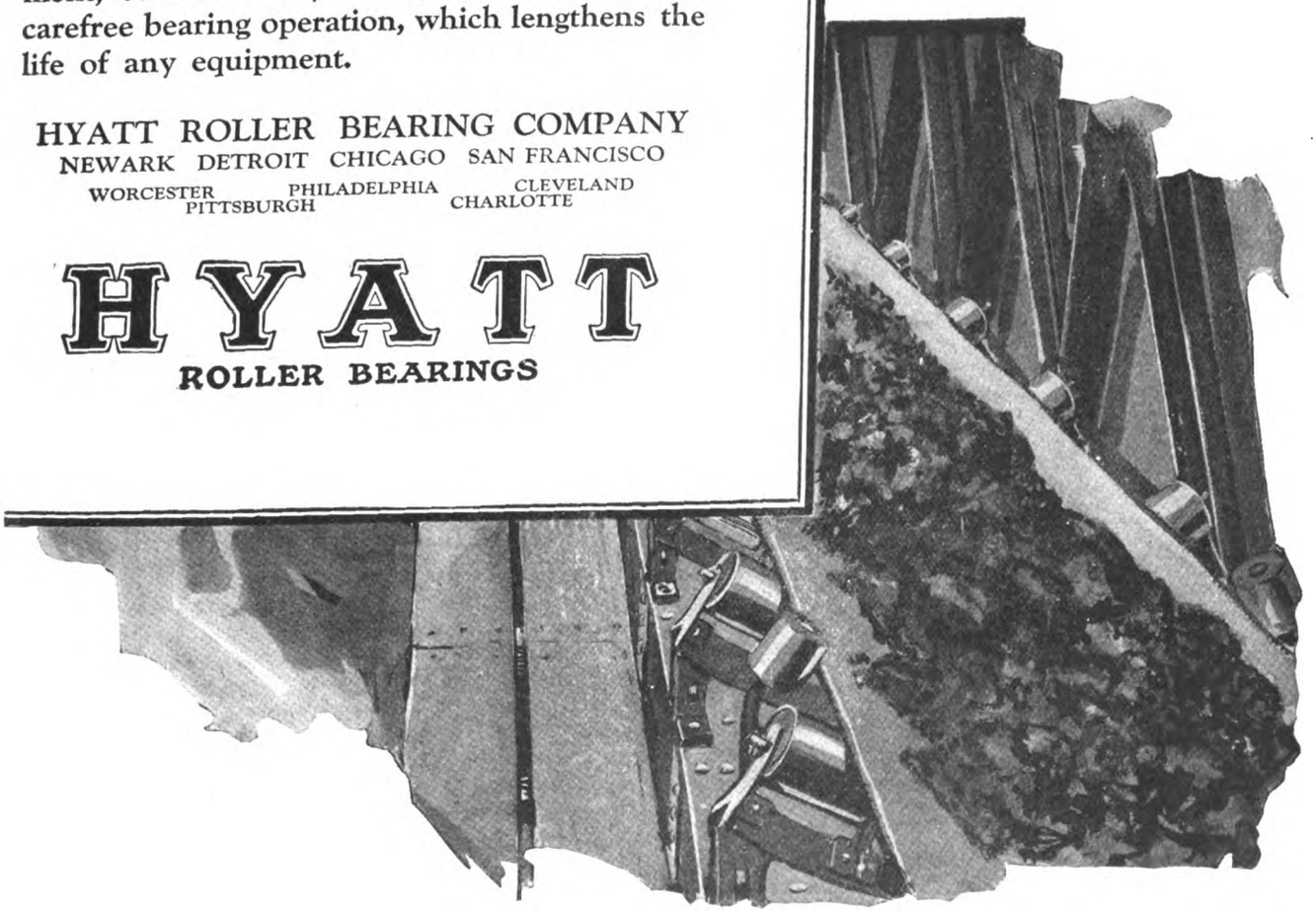
Years of successful operation in the mines, at breakers, coal yards and power houses, have won respect for Hyatt roller bearings throughout the industry.

Before ordering new coal handling equipment, or replacing the bearings in your present equipment, consult a Hyatt engineer. Be sure of carefree bearing operation, which lengthens the life of any equipment.

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WORCESTER PHILADELPHIA CLEVELAND
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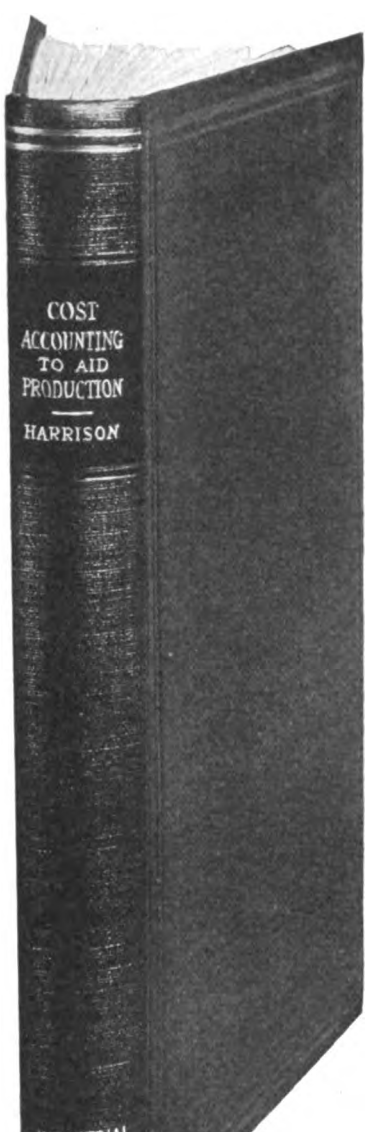
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ROLLER BEARINGS

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Success in business is the result of exercising sound judgment based upon accurate knowledge of conditions, and if the executive is not furnished with reliable and adequate information relative to his cost of manufacture and distribution, he is in the predicament of the master of a ship without the means of determining his position. Generally speaking, the greatest handicap to efficient business operation is that of incomplete, inadequate, and inaccurate information relative to costs and profits. How to correct this condition, if it exists in your plant, is the purpose of Harrison's remarkable book. No man can read it without getting a new conceptoin of the function of cost accounting and a better grasp on the means of solving its intricate problems. Examine the book ten days and see for yourself. Mail the coupon today and this remarkable volume will be sent to you postpaid at once. Its small cost—$5.00—is out of all proportion to its intrinsic value to you.

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So They Fired This Old Fellow

HE might still be drawing his high wages if one young chap hadn't told the general manager the story of the Old Man of the Sea. That took a lot of nerve and the G. M. was just going to throw him bodily out of the window when the young chap said "Wait a minute."

"The Old Man

of the Sea who rode around on the shoulders of anyone who'd carry him is in this plant under a new name. We can't see him, but he's riding the shoulders of every one of us—yours, mine and those of every productive man in the plant."

The young chap walked to the window, "Those fellows unloading, wheeling and shoveling coal out there are part of the gang that feeds this Old Man Burden. Their wages are what he makes us carry."

The G. M. didn't know

the Old Man of the Sea from Napoleon. But, the directors had just finished singing to him their 1925 song. It ran like this: "Give us, oh give us lower production costs so that we can meet this competitive market."

So he listened to the young chap. He even sent out a letter over his own signature—and interviewed the Barber-Greene man when he called.

Ten of the Men

who used to shovel, wheel, unload cars and load trucks in the yard have been released for more productive work. Two men and a Barber-Greene "N" Portable Conveyor and a Barber-Greene "U" Portable Conveyor more than replace them. And high car demurrage charges have been eliminated too.

Old Man Burden has been fired. Perhaps Mr. Barber's Scrapbook might give a couple of hints on how he could be fired out of your plant. A copy may be had for the asking.

Here's a Barber-Greene "N" unloading and storing with the help of a Barber-Greene Coal Feeder. With a two man gang this equipment handles a carload of mine run Pocahontas direct to storage piles in one hour.

Similar men and money saving layouts are shown by pictures, text and diagrams in our "Mr. Barber's Scrapbook." Your copy is waiting for you.

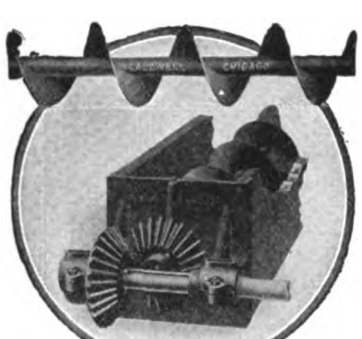


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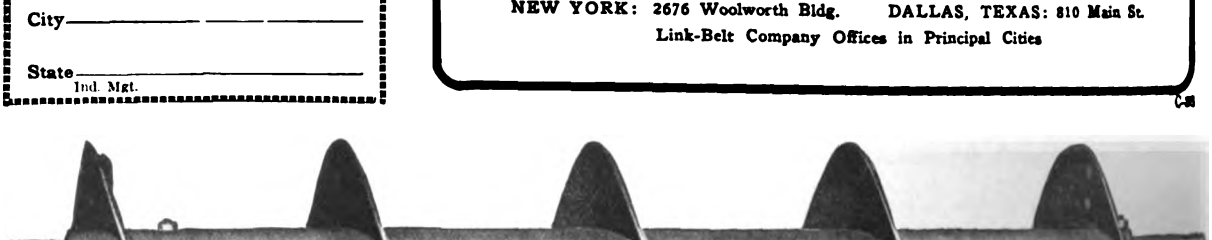
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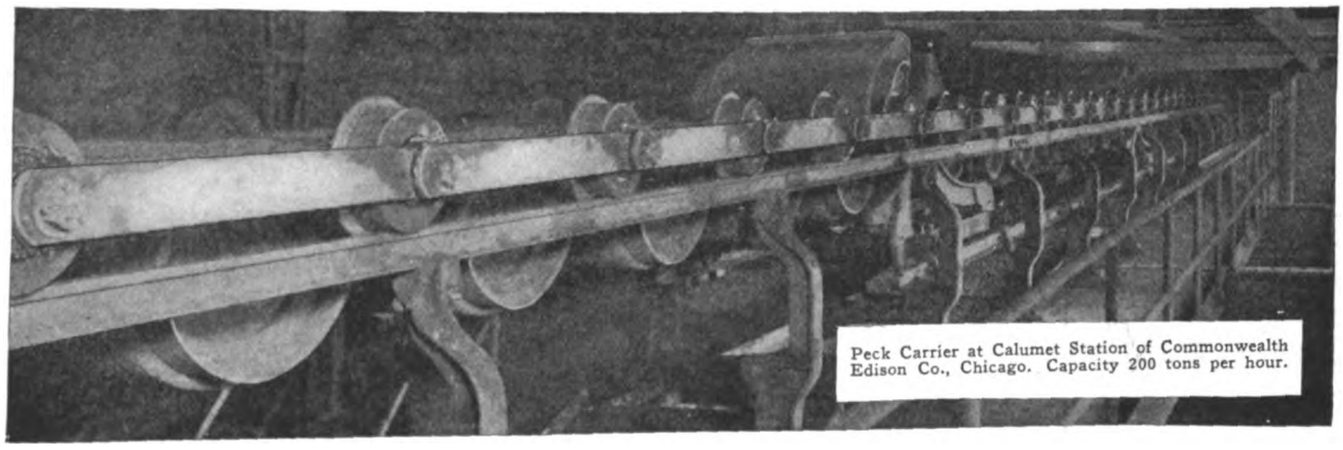
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Peck Carrier at Calumet Station of Commonwealth Edison Co., Chicago. Capacity 200 tons per hour.

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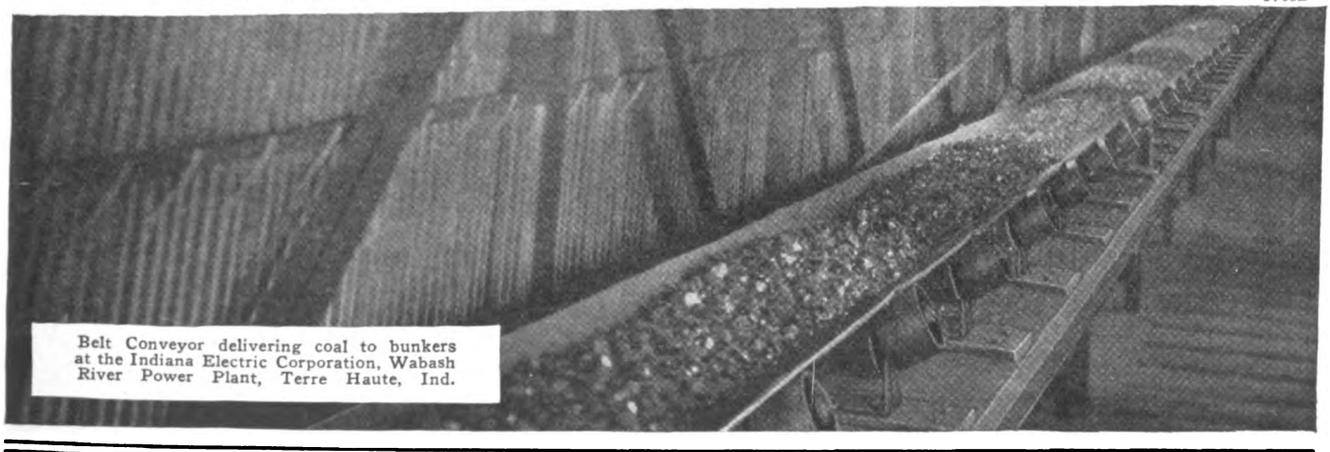
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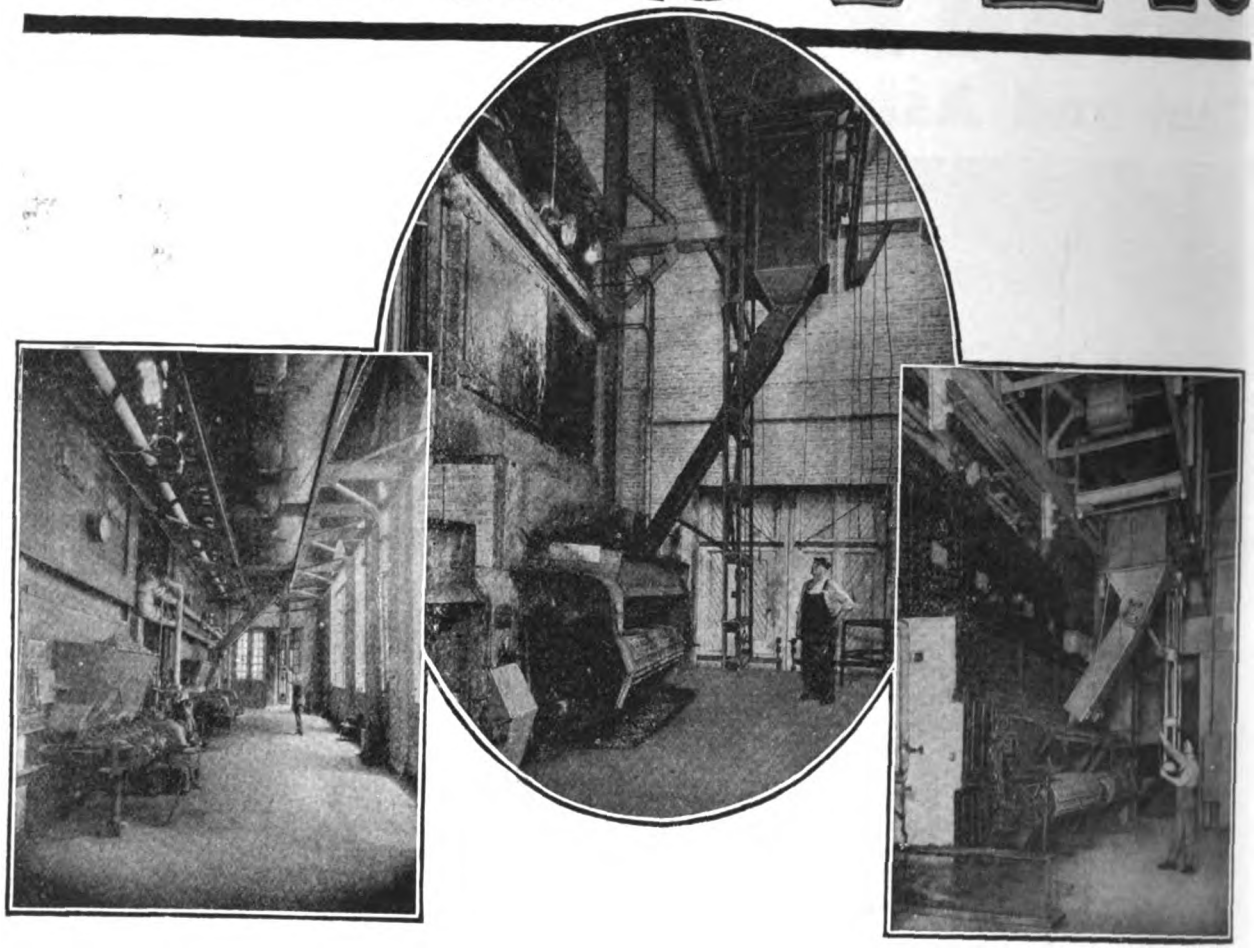
1763B



Belt Conveyor delivering coal to bunkers at the Indiana Electric Corporation, Wabash River Power Plant, Terre Haute, Ind.

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Save Fuel and Labor with a Webster Weigh Larry

The present agitation for higher efficiency in the boiler room is an economic demand that competitive conditions in modern industry has made necessary. Costs for *power* must be as carefully computed as other manufacturing costs.

Webster coal and ashes handling machinery in the boiler room saves both fuel and labor and makes a clean orderly boiler plant easy to maintain at all times.

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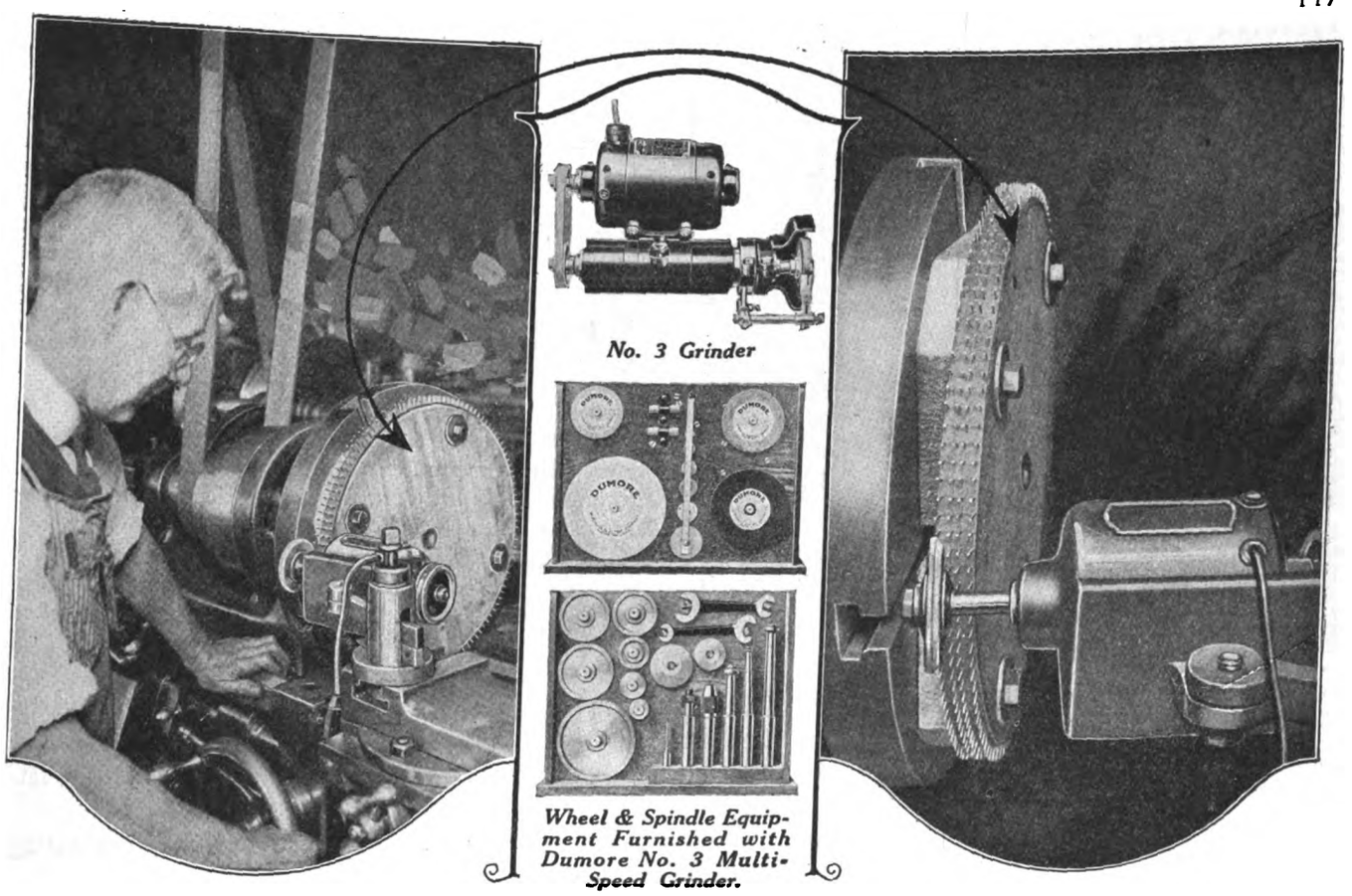
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Dumore Saves the Day on "Tricky" Jobs

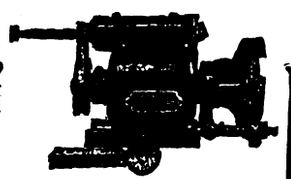
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Simple? Nothing to it! Dumore convenience and accuracy simplifies all kinds of "tricky" grinding.

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For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R.P.M. Self-aligning ball bearings. Comes completely equipped.



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Dumore High Speed Grinders are sturdy, easy to move, and operate on either AC or DC current. 6 styles and sizes.



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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Mercon Regulator

A 12-page illustrated booklet on the subject of the Mercon Regulator has been issued by D. H. Skeen & Co., 407 So. Dearborn St., Chicago, Ill.

Metallic Packing

Catalog No. 10, which describes and illustrates American Metallic Packing, has been issued by the American Metallic Packing Co., Pittsburgh, Pa.

Brass Showers and Fixtures

A small illustrated booklet has been issued describing the operations in making brass showers and fixtures in the plant of the Speakman Co., at Wilmington, Del.

Herringbone Speed Reducers

Bulletin No. 38, which illustrates and describes Falk Small Herringbone Speed Reducers of the single, double, and triple reduction types, has been issued by the Falk Corp., of Milwaukee, Wis.

Single Phase Motors

A booklet containing 35 pages of illustrations and description of Jeannin Single Phase Replusion Induction Motors has been issued by the Jeannin Electric Co., of Toledo, Ohio.

Baling Presses

of several types, including the chain type, toggle lever, hydraulic, etc., and scrap metal presses, pumps and hydraulic machinery, are described in bulletins issued by the Logemann Bros. Co., of Milwaukee, Wis.

Twist Drills, Reamers, Arbors, Cutting Tools, etc.

The Morse Twist Drill and Machine Co., of New Bedford, Mass., has issued an illustrated catalog with principal topic subdivisions as follows: Sockets, Drills, Countersinks, Arbors, Reamers, Cutters, Taps and Dies, and a General Index. Another booklet issued is the Machinist's Practical Guide containing data and tables on Morse Tapers, Steel Drills, Tap Threads, etc. Additional descriptive literature is on Taper Shanks, Drills, and other Morse products.

Point-Thinners and Drillpointers

Four bulletins illustrating and describing Oliver products, including the Point-Thinner, Burnishing Barrel, Drillpointer and Die Making Machine, have been issued by the Oliver Instrument Co., Adrian, Mich.

Twist Drills

A 16-page booklet entitled "The Drill for Today," which is a brief treatise on the development and characteristics of drills, has been issued by the Detroit Twist Drill Co., of Detroit, Mich.

Pipe Threading Machines

A 12-page illustrated booklet describing Landis Pipe Threading Machines has been issued by the Landis Machine Co., Waynesboro, Pa.

Plugs and Receptacles, Hand Lamps, etc.

Several pieces of descriptive literature on Arktite Circuit-Breaking Plugs and Receptacles, Safety Hand Lamps, Electric Hand Lanterns, Imperial Floodlights and Projectors, Condulets, etc., have been issued by the Crouse-Hinds Co., Syracuse, N. Y.

Catalog of Electrical Supplies

for 1925-1927 has been issued by the Westinghouse Electric and Mfg. Co., of East Pittsburgh, Pa., containing 1,183 pages of illustrations and description with principal topic subdivisions as follows: Discounts and General Index, Lightning Arresters, Static Condensers, Disconnecting Switches, Circuit Breakers, Switchboards, Voltage Regulators, Switchboard Accessories, Watthour Meters, Instruments, Relays and Instrument Transformers, Distributing Transformers, Feeder Regulators, Micarta and Insulating Materials, Line Material, Porcelain Insulators, Street Lighting Systems, Safety Apparatus, Rectigons, Appliances and Ranges, Fans, Interior Lighting, Wiring Devices, Motors and Control, and a Style Number Index.

Steel Flanged Fittings

Bulletin No. 2, on the subject of Distortion Test of 4-inch, 400 lbs. Working Steam Pressure Walworth Sigma Steel Flanged Tee, has been issued by the Walworth Co., of Boston, Mass.

Vertical Engines and Direct Current Generating Sets

are described in Bulletins Nos. 302 and 105, respectively, which have been issued by Engberg's Electric & Mechanical Works, of St. Joseph, Mich. These bulletins contain 32 pages each and are profusely illustrated. Two more bulletins issued are descriptive of direct current generators and motors and alternating current generating sets.

"Superheat Engineering Data"

is the title of a handbook on the generation and use of superheated steam and related subjects which has been issued by the Superheater Co., 17 East 42nd St., New York. This handbook contains 208 pages, 85 illustrations and diagrams and 69 tables, and the price is $1 per copy.

Water Softener

The Zeolite Water Softener is illustrated and described in Bulletin 509, which has been issued by the Graver Corp., of East Chicago, Ind.

General Products Bulletin

No. 125 containing illustrations and descriptions of several types of Air Compressors, Vacuum Pumps, Aftercoolers, and Centrifugal Pumps, has been issued by the Pennsylvania Pump and Compressor Co., Easton, Pa.

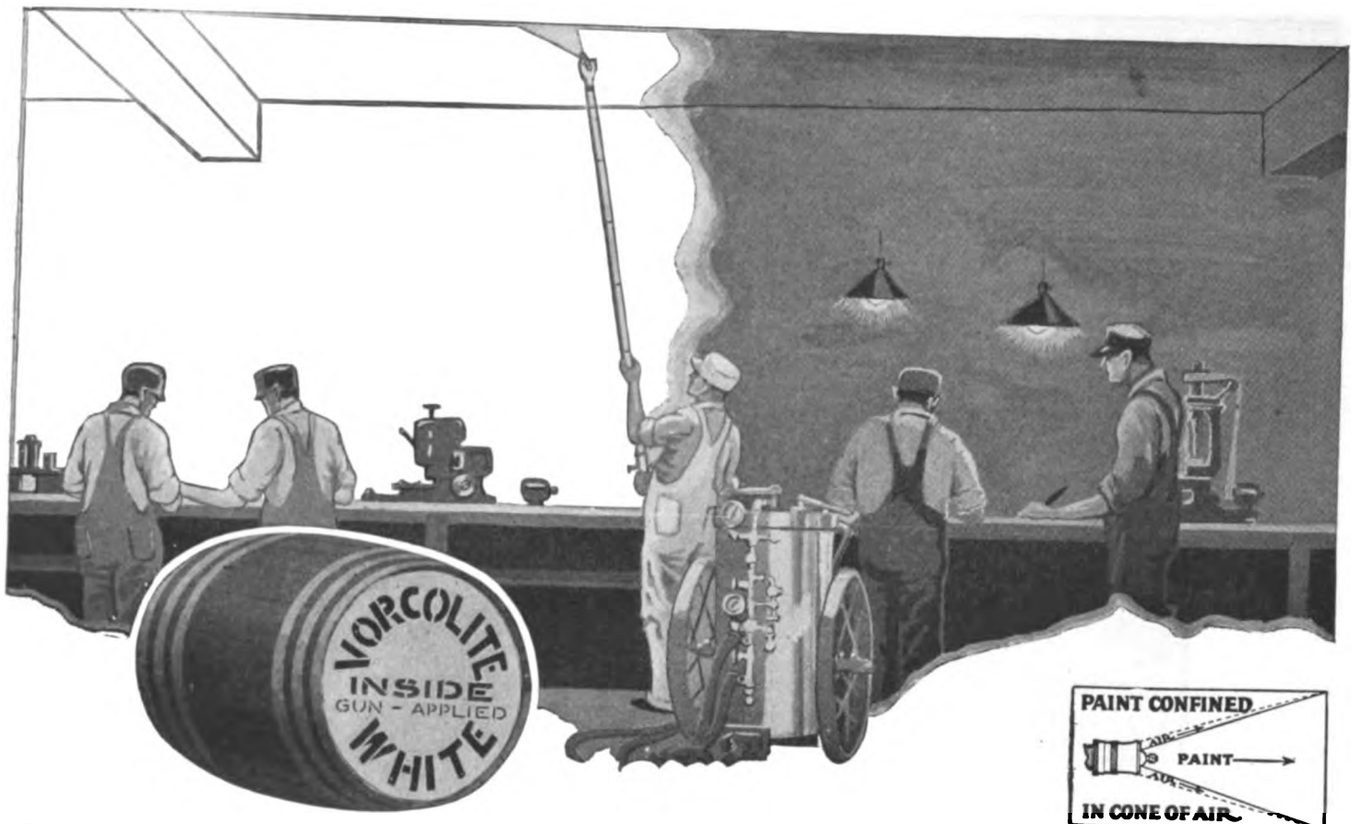
Motion and Operation Recorder

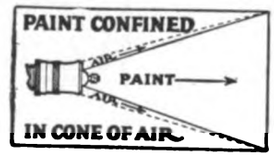
Catalog No. 1600, containing 20 pages, which illustrate and describe Bristol's Mechanical Motion and Electrical Operation Recorder, has been issued by the Bristol Co., of Waterbury, Conn. Two other bulletins issued, Nos. 332 and 1303, describe Electrical Recording Instruments and Gas Filled Recording Thermometers, respectively.

Grinding Wheel Information

is contained in a small booklet of 35 pages, which has been issued by the Norton Co., of Worcester, Mass.

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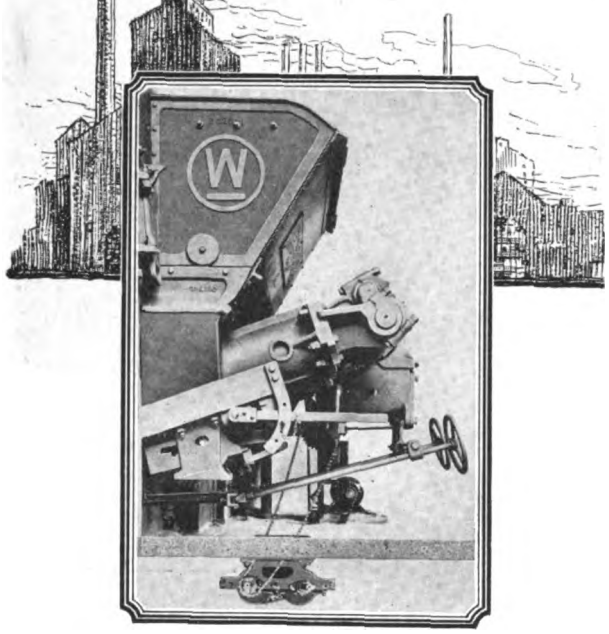
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In Plants Like Yours



Photograph shows a REEVES Transmission controlling the speed of the new model Westinghouse Multiple Retort Underfeed Stoker.

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See Our Exhibit at the Power Show, New York, Space 60-A, Nov. 30 to Dec. 5

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Variable Speed Transmission

Detex Watchclocks

Two pieces of descriptive literature have been issued on the Detex Watchclocks and Detex Eco Watchclock Systems, which are manufatured by the Detex Watchclock Corp., 4147 Ravenswood Ave., Chicago, Ill.

Rotary Positive Blowers and Rotary Displacement Meters

are described and illustrated in Bulletins 18D and 4C, which have been issued by the Connersville Blower Co., Connersville, Ind.

Flow Meters

Bulletin No. GEA-10, containing 44 pages of illustrations and description of G-E Mechanically Operated Flow Meters for measuring fluids and gases, has been issued by the General Electric Co., of Schenectady, N. Y.

Small Tools

Catalog No. 49, containing 383 pages of information on the subjects of Ground Thread Taps, Spiral Fluted Staybolt Taps, Screw Plates, Dies, Twist Drills, Reamers, Screw Slotting Cutters, Gages, Pipe Tools, Machine Tools, and other products manufactured by the company, in addition to tables and index, has been issued by the Greenfield Tap and Die Corp., of Greenfield, Mass.

Revolvators

"Two Decades of Revolvators" is the title of a 12-page illustrated booklet, which has been issued by the Revolvator Co., 336 Garfield Ave., Jersey City, N. J.

Applied Illumination

as secured by "White" Adjustable Electric Light Fixtures is the subject of an illustrated booklet which has been issued by the O. C. White Co., Worcester, Mass.

Ball and Roller Bearing Motors

Bulletin No. 4000, containing illustrations and description of Ball and Roller Bearing Reliance Motors of the direct and alternating current types, has been issued by the Reliance Electric & Engineering Co., Cleveland, Ohio.

CO_2 Recorder and Meter

The Apex CO_2 Recorder and CO_2 Meter are described in illustrated bulletins issued by the Uehling Instrument Co., 473 Getty Ave., Paterson, N. J.

Spiral Chutes

An illustrated folder describing Standard Spiral Chutes has been issued by the Standard Conveyor Co., North St. Paul, Minn.

Goggles

A 22-page illustrated booklet describing Willson Goggles for protection in chipping, riveting, scaling, welding, cutting, and similar work, and Willson Helmets for Electric Welding has been issued by Willson Goggles, Inc., of Reading, Pa.

Fiftieth Anniversary Brochure

has been issued by the Holtzer-Cabot Electric Co., of Boston, Mass. In this book is shown the commemorative shield which was presented to Mr. Holtzer by the employees of the company.

"Five Minutes with the Coal Bill"

is the title of a booklet which describes the Huber Stoker and which has been issued by the Flynn and Emrich Co., of Baltimore, Md.

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A tractor that leads in its class —and sells at a remarkable price

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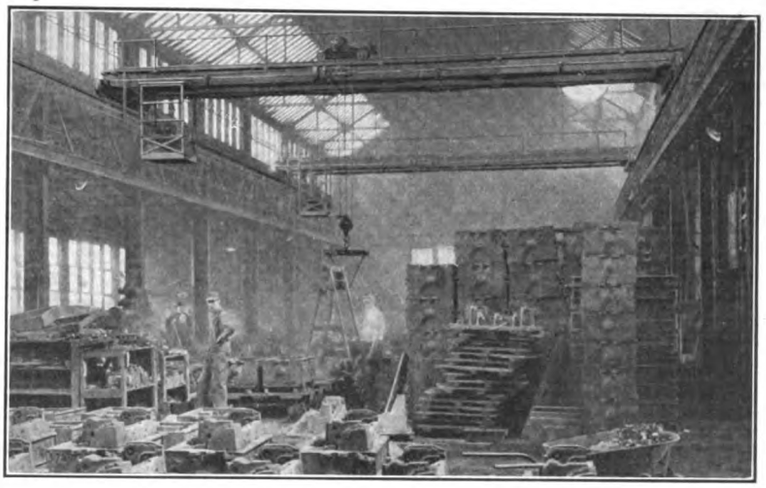
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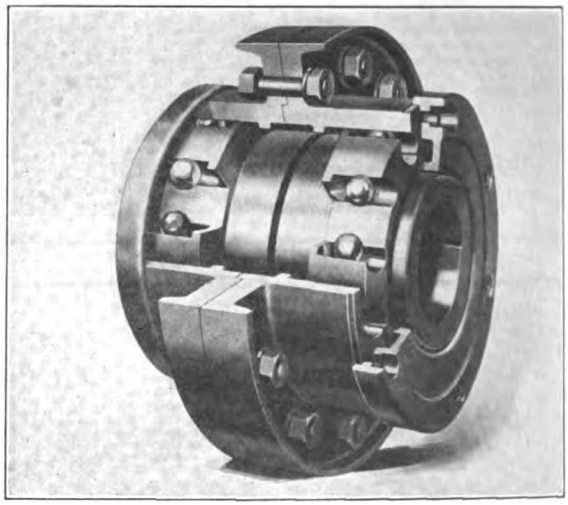
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A New Coupling for Misaligned Shafts

A NEW type of shaft coupling has been put on the market by the Farrel Foundry & Machine Company, Buffalo, N. Y. This coupling is designed to take the place of the usual type of flexible coupling. The makers state that this Sykes Universal Shaft Coupling differs from other flexible couplings in that it is really a universal joint and is, therefore, capable of not only taking care of small errors in alignment, but will also successfully connect shafts which are grossly misaligned. Its limit of angularity is stated to be 5°. It will also connect shafts which are offset as much as 4% of the shaft size. For instance, a coupling made for a 4″ diameter shaft will allow an offset up to as much as .16″.

The accompanying illustration shows a coupling with a portion of the outer shell cut away so that its detailed construction is readily understood. It will be seen from the illustration that the coupling consists mainly of three parts. It is, therefore, what is known as a three-element coupling. Two of the elements are in the form of hubs, one adapted to key on the driving shaft and the other on the driven shaft. The third element is



made in halves and forms a sleeve, connecting the other two elements. The actual connection, however, is by means of ball bearings in races or grooves formed in lugs. It will be seen from the illustration that one set of lugs is on each of the hub members and corresponding lugs, inwardly projecting, are on the sleeve member. The sleeve member is made in halves for convenience during installation.

The new coupling is at present standardized for shafts from ¾″ diameter up to 8″ diameter. Larger sizes will be manufactured later. The 8″ coupling will transmit 1,200 hp. per 100 r.p.m. The makers issue a list giving all dimensions and power transmitting capacities.

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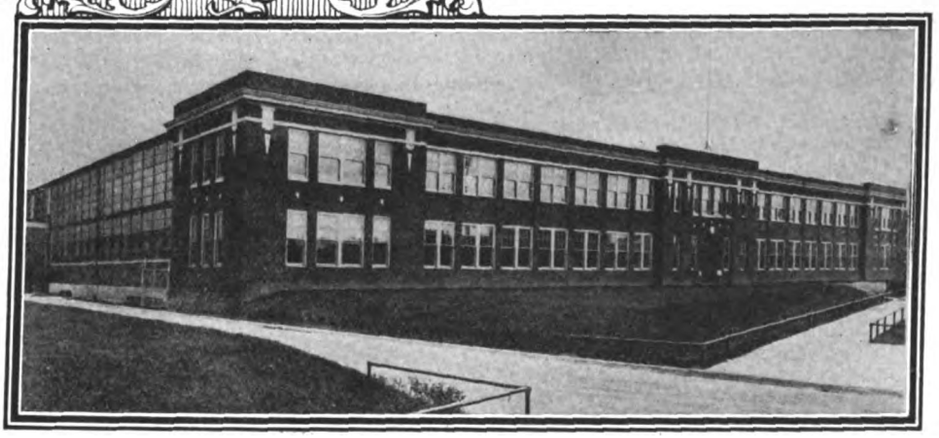
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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co., page 102.

Catalog No. 385K Issued by the Jeffrey Manufacturing Company, shows various installations of coal handling systems. See page 101.

Catalogs and Engineering Service on the Application of Motors to Every Type of Equipment is offered by the Star Electric Motor Company. See pages 98-99.

The Solution to Your Paint Problem. See page 36. American Asphalt Paint Co.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see pages 62, 117, Wisconsin Electric Co.

A 60 Page Book on Floor Operated Electric Hoists and Also the "Book of Illustrated Economies," can be obtained from the Shepard Electric Crane & Hoist Company. See Back Cover.

Information on Hytor Vacuum Pumps used on exhaust steam heating system is given on page 10. Nash Engineering Co.

The Latest Data on Battery Performance and Battery Cost in electric industrial trucks is given in the service rendered by the Electric Storage Battery Company. See page 66.

Catalog No. 26 Is a Clear Exposition of Present Day Speed Reduction Practices. See page 89. W. A. Jones Foundry & Machine Co.

Information Describing the "Blue Streak," a New Cowan Self Loading Truck is described on page 65. Cowan Truck Co.

An Analysis of Belt Requirements and Uses is made in an interesting booklet, offered by the Chas. A. Schieren Company. See pages 80-81.

Bulletins Describing Locomotive Cranes in sizes from 10 to 50 ton capacities, suitable for handling heavy materials from pig iron and scrap to pulp wood and other products should prove of interest to every industrial executive. Can be had by writing The McMyler-Interstate Co. See page 56.

The Productimetor Catalog Describes Counting Machines which aid in speeding up production. For a copy see page 32. Durant Manufacturing Co.

Information on Sanitary Drinking Fountains, together with prices and specifications, can be obtained from Rundle-Spence Manufacturing Company. See page 64.

Five Very Interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 49.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 50.

A Condensed Handy Catalog and Price List showing the complete line of Chucks and Arbors is now ready for mailing by The Jacobs Mfg. Co. See page 57.

Catalog No. 860 Illustrates and Describes Applications of Fans and Blowers for every kind of work. See page 72. Buffalo Forge Company.

Catalog "S" Shows a Means of Solving Current Supply and Cord Maintenance and Economy. See page 90. Appleton Electric Co.

Eliminating Dust, Filings, Lint, etc., from Workrooms as a means towards industrial efficiency is described on page 7 by Invincible Vacuum Cleaner Manufacturing Company.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 57.

The New Narrow Center Hyatt Line Shaft Box that fits all makes of hangers is described on Inside Front Cover and pages 110-111. Hyatt Roller Bearing Co.

Bulletin No. 42, Issued by the Elwell-Parker Electric Company, shows a type of electric crane truck in use everywhere. See page 59.

Form No. 536, Describing the 7½ H.P. Squirrel-Cage Polyphase Induction Motor and Bulletin 38, describing the Century type SC Motor. See page 91. Century Electric Co.

A 30-Day Trial Offer on the Federal Electric Siren is offered on page 46. Federal Electric Company.

Grinding Machines for Internal, External, Surface, Thread and Extra-deep-hole Grinding. J. E. Gilbert Grinder Company. Page 44.

A Folder, "Choosing the Locomotive for the Industrial Plant," can be obtained from Davenport Locomotive Works. See page 23.

Industrial Railway Equipment of every description is manufactured by Easton Car & Construction Co. Complete bulletin issued. See page 70.

The Value of Good Lighting in Industry is shown on page 38 by the Industrial Lighting Committee of the National Electric Light Association.

The Overhead System of Coal Handling and Conveying is described in a bulletin entitled, "Coal, How It Is Handled." To obtain a copy see page 109. The Hayward Company.

The Working Model of "The Telescoper" Showing how it Works, is offered by the Economy Engineering Company. See page 53.

The Aid Given to Manufacturers in the Use of Fractional H. P. Motors is described on pages 62-117. Wisconsin Electric Co.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchclock Corp. See page 30.

Free Bulletins on Air Filtration System is offered on page 76. Reed Air Filter Company.

No. 11 of the S. K. F. Certified Campaign Against Friction is given on page 85. S. K. F. Industries, Inc.

The Elimination of Production Losses through the use of precision ball bearings and roller bearings is part of the service rendered by the engineers of the Norma-Hoffman Bearings Corp. See page 68.

Consultation Service on Forced Draft, Ventilation, Air Conditioning and Heating. See page 83. American Blower Co.

The World's Market Place for Industrial Equipment is a description given to the Dodge Service to Industry. See pages 94-95. Dodge Manufacturing Corp.

Keeping Dirt and Dust Out of Electrical Equipment is essential to efficient operation. A descriptive folder giving price list of portable electric blowers and testimonials by leading manufacturers is offered by Clements Mfg. Company. See page 44.

Coal Handling Economy, possible whether handling five or five hundred tons, is shown on page 103 by Gifford-Wood Company.

A Detail Description of the New Air Circuit Breaker for Alternating Current. See page 8. The Cutter Company.

The Advantages of Co-ordination of Parts, Motors and other Accessories for cranes is proven on page 104, Harnischfeger Corporation.

"Mr. Barber's Scrap Book," contains information on the reduction of handling costs. See page 113. Barber-Greene Company.

The Booklet, "Getting the Drop on Competition," contains some valuable information on saving time and increasing production. See page 6. McCaskey Register Co.

Bulletin No. 104 Describes the Type "L" Twin Front Wheel Model Tractor. For a copy see page 121. Mercury Manufacturing Co.

End Grain Wood Wheels for Trucks used in industrial building is described on page 72, by the Metzger Company, Inc.

Cranes that Have Raised Profits Through Better Handling. See page 123. The Euclid Crane & Hoist Co.

An Automatic Conveyor that Costs Less than One Dollar per Week, is shown on page 54, by the Chicago Automatic Conveyor Co.

Catalog Describing the Paracoil Steam Trap with the new patented valve, is shown on page 49. Davis Engineering Company.

Bulletin 35 Describes a Clutch which is adaptable and standardized for many various machines. See page 2. Conway Clutch Company.

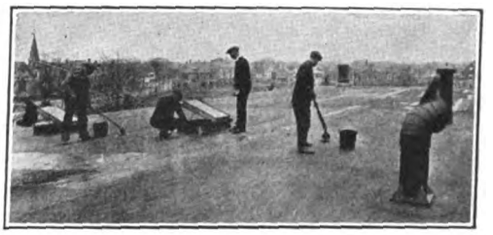
A Steam Trap on 30 Days' Free Trial. Also booklet R-260, which describes the new Number 9 Sarco Steam Trap. See page 71. Sarco Company, Inc.

C-100 is a Descriptive Booklet Offered by the Edwin L. Wiegand Company and describes heating strips for every industrial purpose. See page 131.

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Four ways to reduce plant repairs

Four parts of an industrial plant are especially hard to keep in good condition. These four are the floor, walls, roof and exterior. Many well-known companies, after much experimenting, have found what they consider the most economical way to maintain these trouble spots in good order. If you would follow their example, read this page.



These men are saving the owner of this building hundreds of dollars. When the roof grew old and began to leak badly the owner did not replace it. He covered it with a coat of Stormtight instead, and for years to come not a drop of water will leak through.

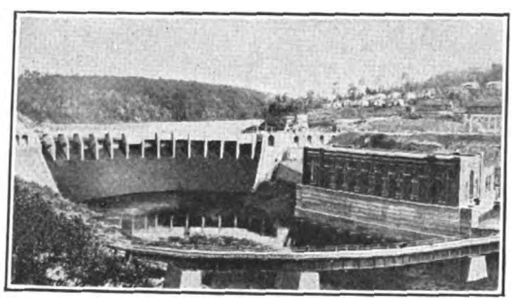
FLOORS—Concrete is the best material yet developed for the floor of a modern industrial plant. Yet even concrete wears away. Its texture is coarse, and under friction tiny particles break off and float into the air as dust.

This harsh dust does much harm to machinery, merchandise and equipment. As the dusting process proceeds, holes and hollows develop in the floor. Finally you have some patching to do—which is unsatisfactory—or production has to be interrupted while a new floor surface is laid. Yet it is an easy matter to make your floors lastingly dustproof, wear-proof and non-absorbent. A treatment with a liquid chemical called Lapidolith will do the trick.



Much of the concrete floor surface in the General Motors Company Building at Detroit, Mich., is dustproof and wearproof, thanks to Lapidolith, the liquid chemical floor hardener. The wood floors of the 4-story laboratory annex are also smooth, hard and sanitary, for they have been treated with Lignophol.

Lapidolith is the original concrete floor hardener in this country. You simply flush it on a floor like water. It penetrates the concrete, binds the loose particles together, fills up the voids and hydrates the free lime. A fine, dense, even surface of crystalline formation is formed. This surface acquires a hard polish. It is impenetrable; it is proof against friction and wear; it is acid-resisting; it is impervious to water. Lapidolith can be used on either a new or an old floor. If applied at night the floor is ready for business by morning. After that you can forget your floor for good.



This is the new Piney Development of the Clarion River Power Company in western Pennsylvania. Large quantities of both Cemcoat and Lapidolith were used by the engineers. Cemcoat was the paint chosen because it adheres to concrete just as easily as to wood, and it stays white long after other paints turn yellow. Lapidolith not only hardens concrete but makes it non-absorbent and practically waterproof as well.

If you have wood floors in your plant you must have experienced the trouble and expense of frequently applying floor oils. You can be rid of this bother by treating your wood floors with an application of Lignophol, the preservative liquid floor dressing.

Lignophol penetrates the wood, restoring its natural oil and gums. It prevents the wood from rotting, splintering or drying out. One application keeps a floor smooth, hard and sanitary for years, without any other treatment. Lignophol is not sticky; it is non-inflammable; it has no unpleasant odor.

PAINTED SURFACES—A bright cheerful interior is an asset to any plant. It is easy to have such an interior if you wish to go to the expense of repainting every year or two. That may be necessary with paints that quickly yellow with age, or become hopelessly grimy with dust. If walls are painted with Cemcoat, the gloss, eggshell or flat enamel paint, however, you can have interiors that are lastingly clean and white at a very low cost. Cemcoat is a paint that stays white for years. It can be washed again and again, and each time the paint comes forth as fresh as the day it was applied. Because of its body Cemcoat usually requires one less coat than other paints on a given surface. It is highly resistant to heat and fumes. It adheres to a brick or concrete wall just as easily as to wood, for it is not affected by free lime. Cemcoat is made for exteriors as well as interiors, in white and colors.

ROOF — When your roof develops a leak, you want to be able to fix the trouble at once, before any great harm results. By means of a semi-liquid preparation called Stormtight, which science has produced, you can stop a leak in your roof as soon as you find it.

Stormtight is a viscous, rubber-like material, made either in semi-liquid or plastic form, that can be applied by anyone over any roof material —while it is still raining if necessary. It stops a leak like a vulcanized patch plugs a tire. But there is even a more valuable service that this remarkable preparation renders. If you have an old roof that has seen its best days and is about due for replacement, coat the entire surface with Stormtight. You can then postpone re-roofing the building for many years. Stormtight gives you a new roof right over the old one, at but a fraction of the cost of the old roof.

EXTERIOR WALLS—No employee likes to work in a building that is damp. On rainy days is the interior of your plant warm and dry? It will be if you coat the outside walls with Hydrocide Colorless, the perfect water-proofing for brick, masonry, stucco, etc.

Hydrocide Colorless penetrates the surface; it does not run in hot weather for it contains no paraffine; it can be applied in cold weather without heating; it does not collect dust; it can be painted. Best of all, its presence on a building can not be detected. Thus, you can easily make your walls permanently waterproof and yet retain their beauty.

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Conveyor Service for all Material Handling. See page 100. Portable Machinery Co.

Catalog on Boiler Feed Water Regulators. See page 46. Chaplin-Fulton Co.

A Belt Lacer, extremely tough, durable, and pliant is shown on pages 92-93, by the Clipper Belt Lacer Company.

Information on Electric Hoists for All Industrial Departments. Roeper Crane & Hoist Works, Inc. See page 60.

A "Dictionary of Uses," Shows 125 Typical Applications of Electric Strip Heaters. See page 87. The Cutler-Hammer Manufacturing Co.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 105.

Complete Details and Prices of All Steel Fabricated Buildings can be obtained from Blaw-Knox Company. See page 5.

Information and Service on the Use of Electric Heat is offered by the General Electric Company. See pages 26-40-41.

Snap Shots of Sensible Savings. A booklet on the tier lift trucking principle. See page 34. The Lakewood Engineering Company.

An Improved Oven for Cores is featured by Young Brothers Company on page 84.

Pamphlet 101 Contains Complete Information and Prices on Renewable Fuses. For a copy see page 28. Chicago Fuse Manufacturing Co.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 60.

Catalog A-13 Contains Suggestions for Cutting Overhead by means of steel shelving. See page 32. Fred Medart Manufacturing co.

Catalog "M" Gives Some Valuable Suggestions on locker service in industrial plants. Page 22. Durand Steel Locker Co.

Jenkins Bros. Feature Their Line of Valves in use by many hotels, hospitals, industrial plants and public buildings everywhere. See page 56.

"Elapsed Time Records," is a booklet containing interesting data on time keeping problems. Free on request. The Calculagraph Co. Page 54.

Cleaner Machinery, Fastener Production, Longer Life to Bearings and Motors are the results of clean air. See page 3. Kirk & Blum Manufacturing Co.

The Special Features of the Hack Saw Blade is described on page 46, by Victor Saw Works, Inc. Sample blades offered free.

The Cutting Qualities and Greater Production of Threads through the use of high grade ground thread taps is explained on page 51. Morse Twist Drill & Machine Co.

A Booklet Entitled, "Saving Slippage and Space," contains facts on the use of short center drive. For a copy see page 96. F. L. Smidth & Co.

A Catalog Describing Cocheco Belting, a high quality transmission belting is offered by the I. B. Williams & Sons, on page 97.

"Proofs of Performance" is a booklet describing actual performance of Globe-Wernicke Structural Strength Safes in many big fires. The Globe-Wernicke Company. See page 9.

Details of the Ettco Keyless Drill Chuck can be seen on page 50, Eastern Tube and Tool Company, Inc.

Illustrated Folder and Prices on steel platforms, boxes, etc., is described on page 50. The Powell Pressed Steel Co.

A 50% Saving in Labor Through the Use of an Overhead Handling System, is shown on page 19, by the Richards-Wilcox Mfg. Co.

A Free Trial Offer on Ten Gallon of Skybryte and a Skybryte Brush. For coupon see page 44. The Skybryte Company.

A New Alternating Current Motor with many features of approved electrical and mechanical construction has just been developed by the Diehl Manufacturing Company. See page 64.

Air Hoists, Economical, Simple and Efficient described on page 56. Northern Engineering Works.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 49.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 30.

Catalog on the Various Types of Chain Hoists is offered by the Wright Manufacturing Company. See page 62.

A Paint Made Expressly for Galvanized Iron is described on Inside Back Cover by Goheen Corp.

A Book Entitled "Methods of Cutting Metal," giving useful information of handling heavy tough metal cutting jobs, can be obtained from Simonds Saw and Steel Co. See page 28.

Savings Through the Use of Industrial Trucks, figured by a cost accountant, is shown on pages 26-40-41, by the General Electric Co.

General Catalog No. 28 contains the complete line of power saving, transmission equipment, sold by the Pyott Foundry Co. See page 48.

Bulletin No. 26 Describes the Complete line of Baker Tractors, Trucks and Cranes. The Baker R & L Company. Page 64.

Description of the Guaranteed Products of the American Lead Pencil Company. See page 32.

High Speed Drills for high speed production. See page 30. The Cleveland Twist Drill Co.

Sample Band or Hack Saw Blades sent on request. See page 62. The Henry G. Thompson & Son Company.

Complete Protection in Measurement Operations which avoid human errors is shown on page 4. Toledo Scale Company.

A Paint Specially Made for Industrial Use. See page 36. American Asphalt Paint Co.

Foot Protection for Workmen, an aid to efficient production. See page 48. F. J. Stahmer Shoe Company.

Descriptive Circulars Illustrating Steel Fabricated Building for every industrial requirement can be obtained from the Martin Steel Products Co. See page 48.

Illustrated Catalog Describing Compact, Sturdy, Steam Engine for many industrial purposes is offered by the Troy Engine & Machine Co. See page 77.

Coatings that Cut Down Upkeep on Rod, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 127.

Sanitation plus Good Appearance is the theme of Sanymetal Products Company advertisement, page 125. Bulletin offered.

Bulletins on Various Pneumatic Systems in Successful Use are offered by The Dust Recovery and Conveying Co. See page 20.

An Interesting Illustrated Folder describing a well made pressed steel shaft hanger and other transmission pulleys, hangers, etc., can be obtained from the American Pulley Company. See page 88.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 74.

Booklets Describing Valves and Other Equipment for the Boiler Room that save power and make possible greater power efficiency. Offered by the Fairbanks Co. See page 75.

A New Development in Factory Seating. See page 129. Do/More Chair Co.

A 120-Page Catalog on the choice of adjustable Pipe Hangers. Grinnell Company. Page 21.

An Apron Conveyor that Puts Delivery Dates Forward is described on page 132 by the Chain Belt Company.

Bulletin 112 Describing Oil Burners as well as Neilson Survey No. 38, showing an Oil Burner Application for annealing steel castings, is offered by the Hauck Manufacturing Co. See page 60.

An Economical Method of Painting Plant Interiors and Exteriors is shown on page 119. The Vortex Manufacturing Co.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 70.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 58.

Booklets Describing Temperature Control of Power Plant Operation is offered on pages 78-79 by the Taylor Instrument Co.

Catalog "L" 44 Shows Transmission Controlling Speed Reducer for use on automatic stokers. This is manufactured by the Reeves Pulley Co. See page 120.

Descriptive Literature Showing the Steel Hangers with exclusive features. See page 86. Standard Pressed Steel Co.

Book No. 725 Describing the Silent Chain Drive and also catalogs on coal and ash handling systems can be obtained from the Link Belt Co. See pages 106-107-114-115.

Roller Bearings that are a Factor in Lowering the Cost of Coal Handling. See pages Inside Front Cover-110-111. Hyatt Roller Bearing Co.

One of the Various Industrial Uses of Dow Conveyors is shown on page 1, by the Logan Co.

A Product that has Hundreds of Uses is described on page 82. Westinghouse Electric & Mfg. Co.

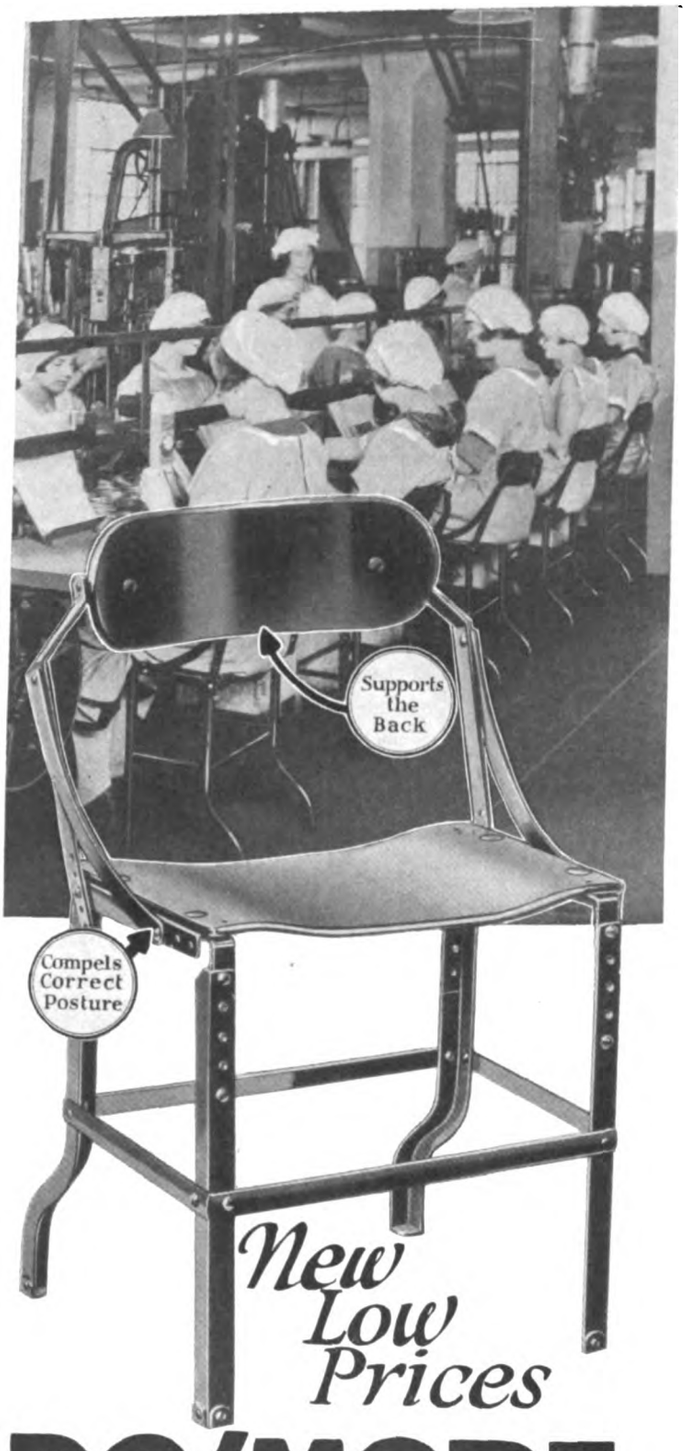
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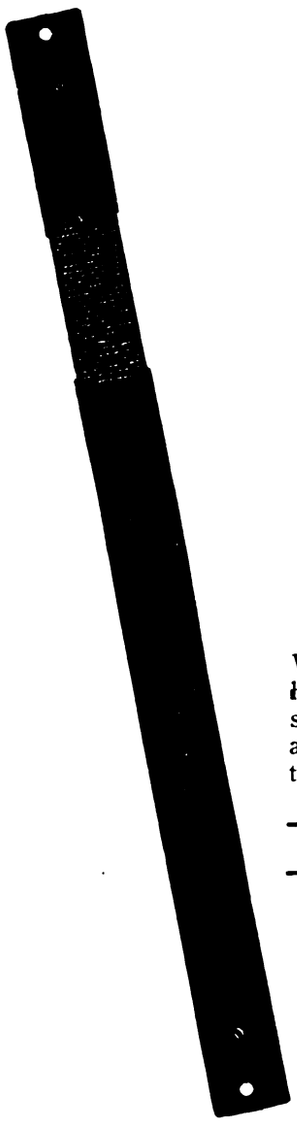
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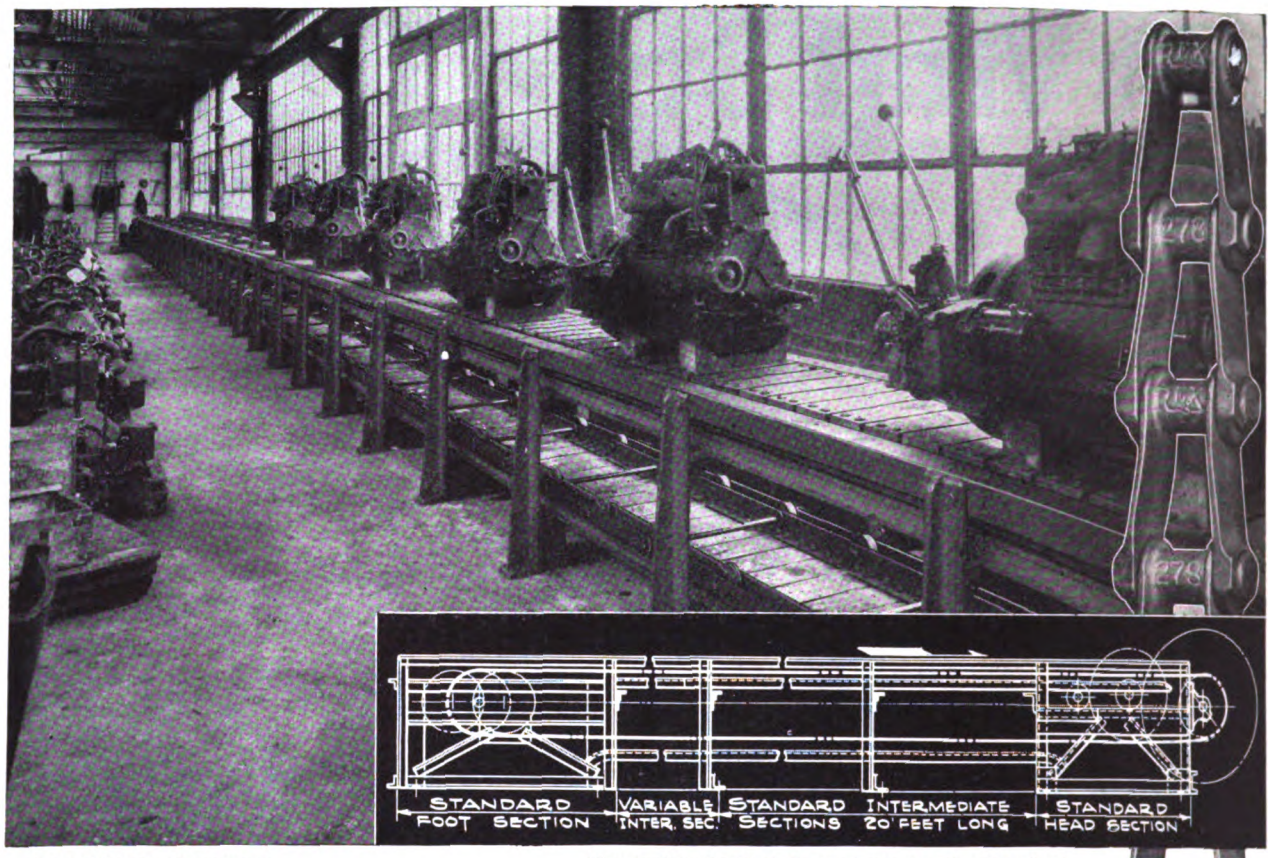
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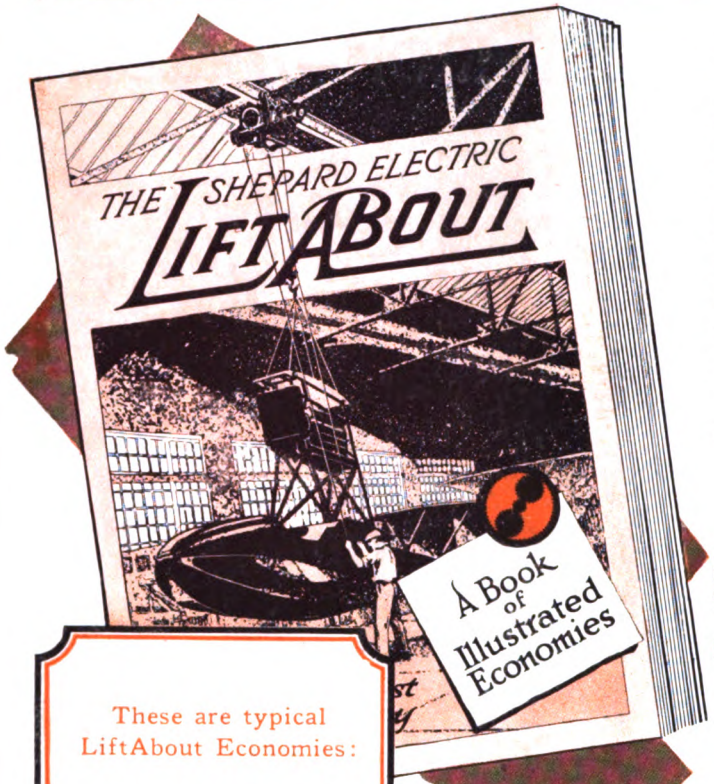
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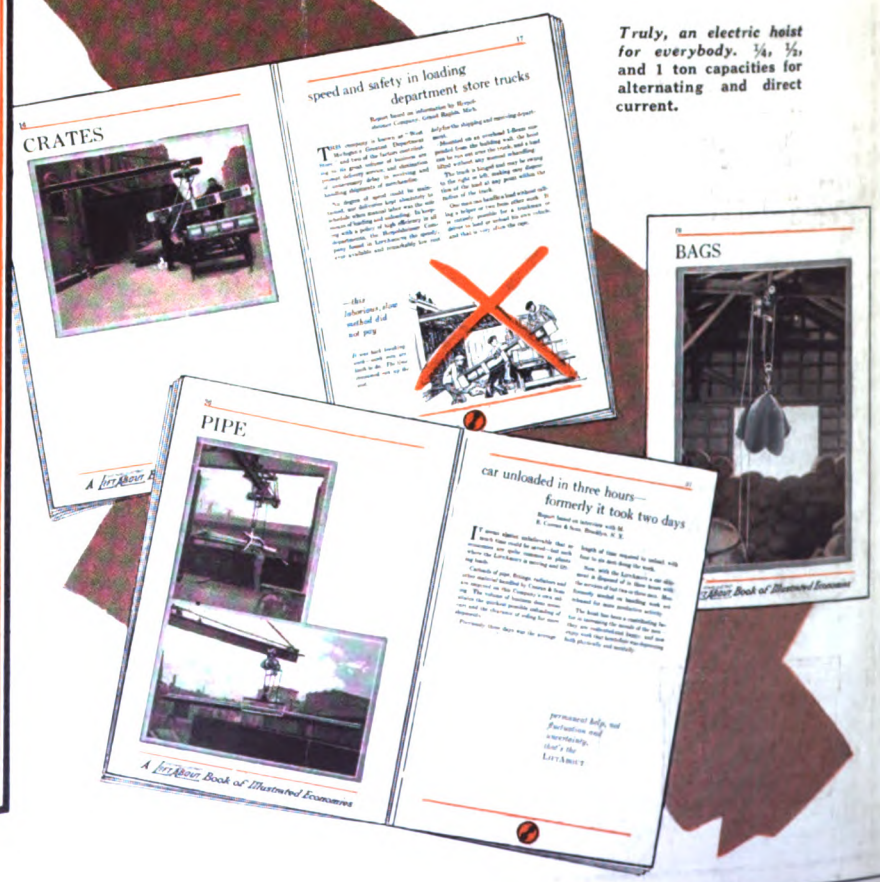
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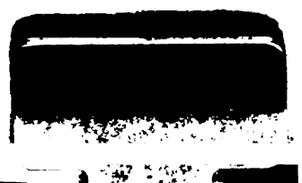
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